



Dr. Vishwanath Karad

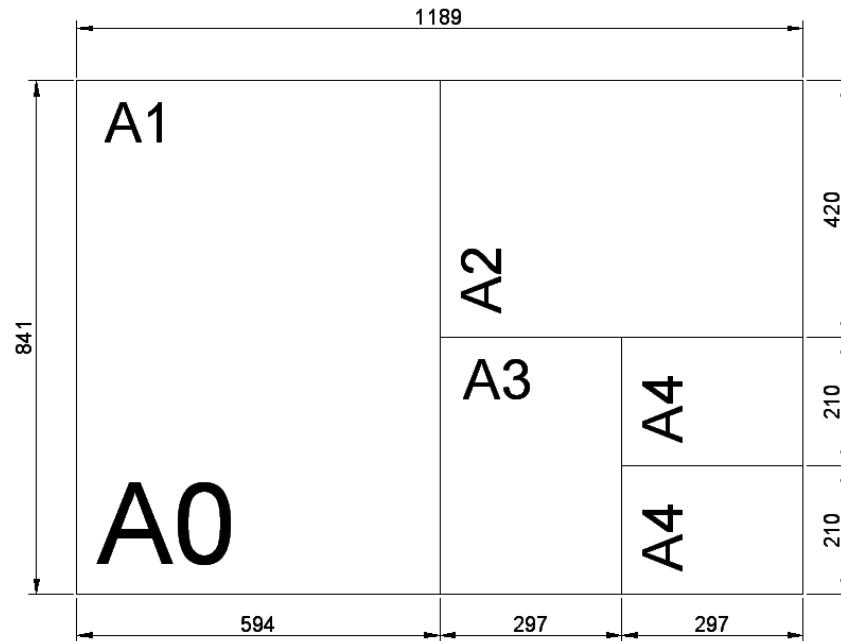
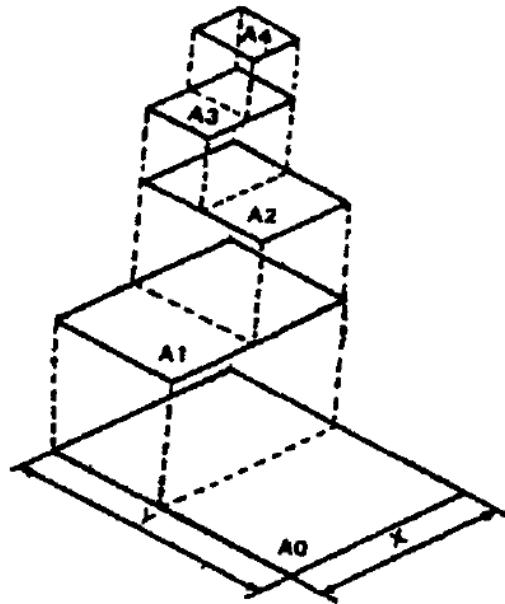
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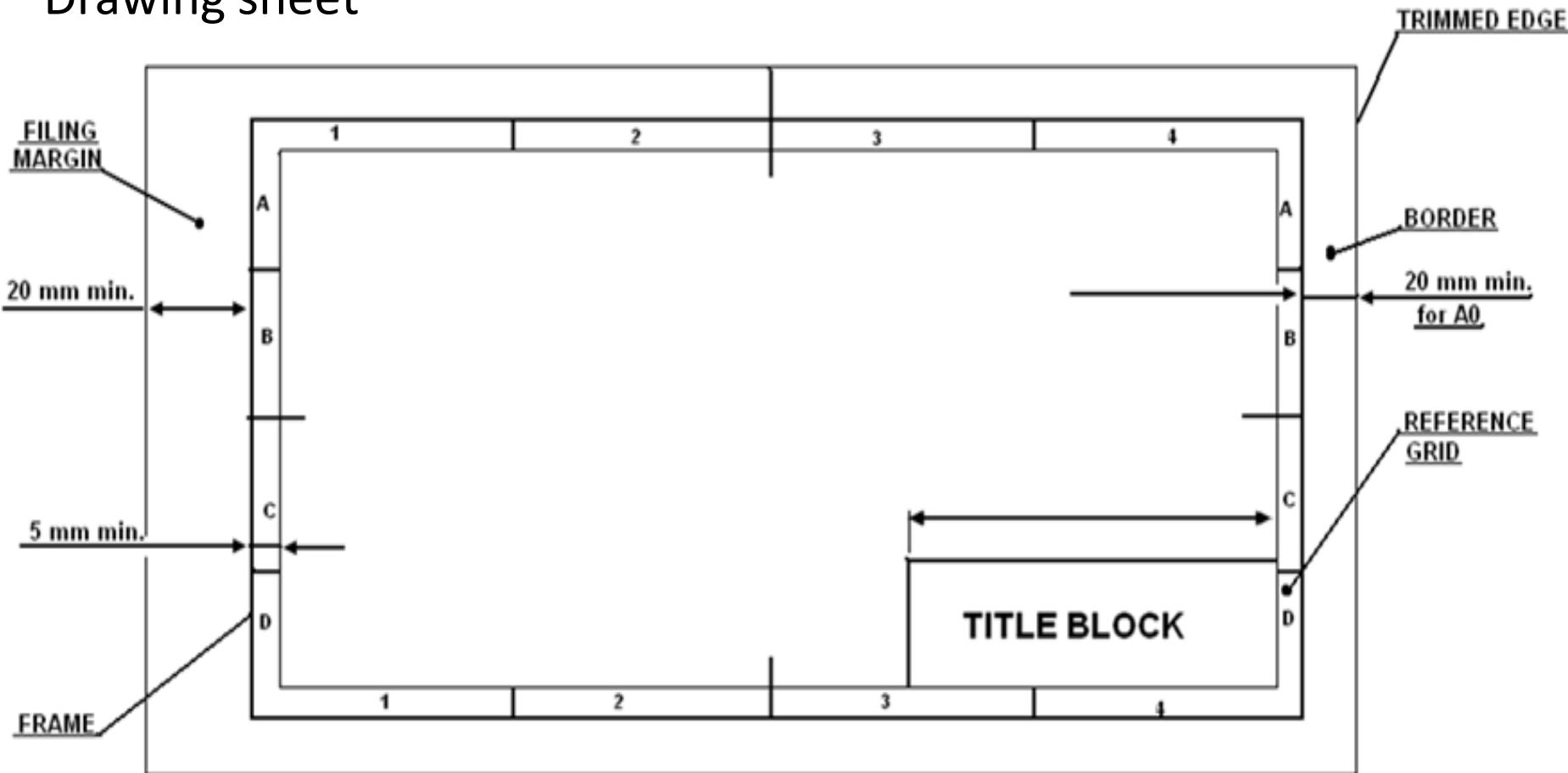
# Integrated Build Environment

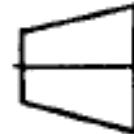
# Drawing paper sizes

The standard drawing sheet sizes are arrived at on the basic Principal of  $x : y = 1 : \sqrt{2}$  and  $xy = 1$  where x and y are the sides of the sheet. For example A0, having a surface area of 1 Sq.m; x = 841 mm and y = 1189 mm.



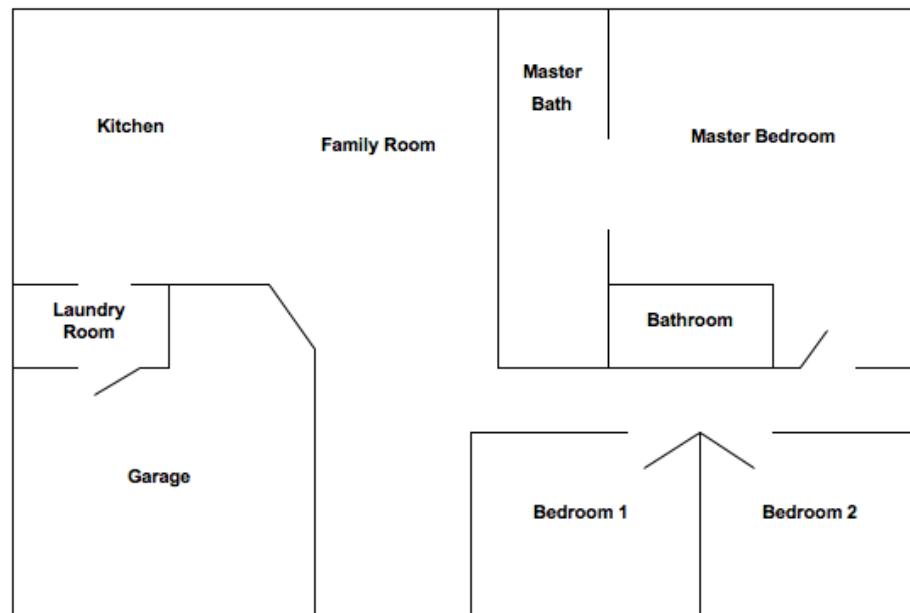
# Drawing sheet



<b>NAME OF STUDENT</b>			<b>TITLE</b>		
CLASS :	DRGNO:	SCALE			
ROLL NO :	GRADE:				
DATE:	VALUED BY				
	50	50	50	50	

## Line diagram:

- ❑ Line diagram is the sketch generally not drawn to particular scale also known as line sketch.
- ❑ The relative positions of all elements like rooms, doors, windows are clearly shown inside to inside.
- ❑ From the given specifications, the thickness of wall in super structure shall be taken to draw the fully dimensioned plan to a convenient scale.



# Plan

- ❑ Plan of building represents a horizontal section of building at given height seen from top.
- ❑ It is a general conventional to imagine that the building has been cut down by a horizontal plane at the sill level of the window and is seen from the top after removal of so cut part.
- ❑ The plan shows the arrangement of rooms, varandah or corridor, position of door, and window and other openings along with their respective sizes. The dimension of the room indicated as Breath x Length.





# Section

- ❖ Section is also known as **vertical section and sectional elevation or cross section**.
- ❖ It is imagined that a finished building is cut vertically along a line so that the building is separated into two portions along the imagined vertical plane **right from top of the building to the lowest part of foundation**.
- ❖ The view that can be seen while travelling along this imaginary vertical plane when looking towards left is drawn to the same scale as that adopted for the plan.
- ❖ The line, which is drawn on the plan to indicate the section, **is called sectional line and represented by A-B or X-X**. The **arrow heads shall be marked** to indicate the way in which the sectional view is to be drawn.
- ❖ In some cases offset is given to indicate the necessary details, but the offset is only to shift the vertical plane from one position to another position.



# Section

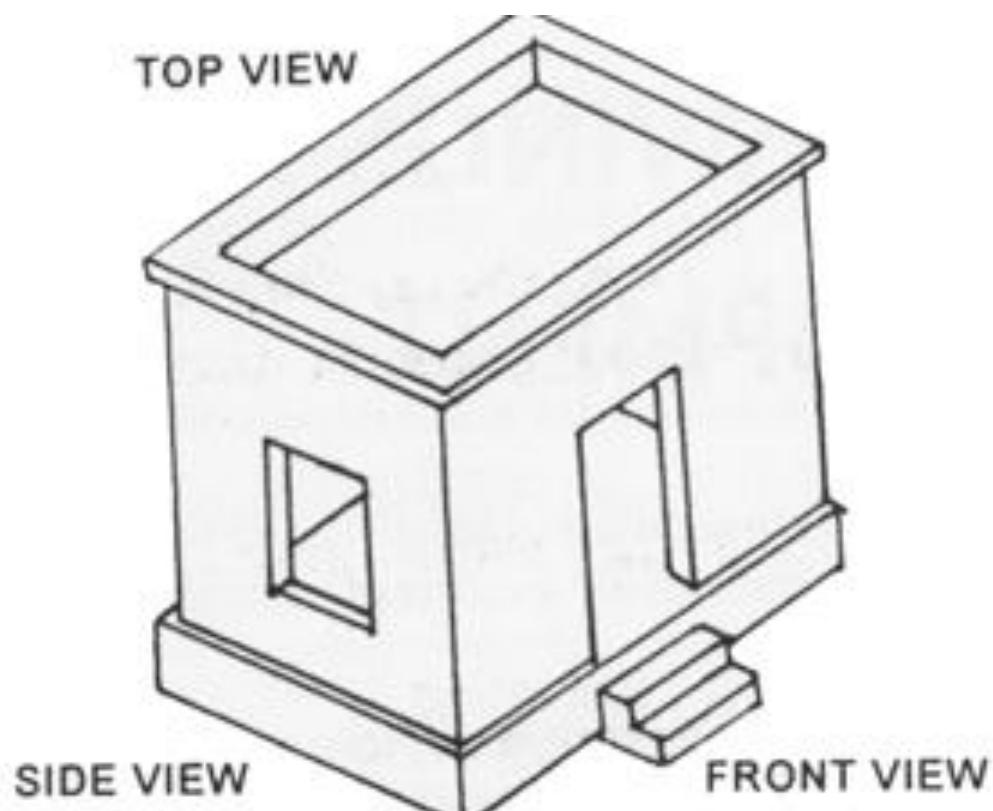
- The necessity of the section is to indicate all the vertical dimensions like, foundation details, basement, details of flooring, height of super structure, sizes of doors, windows, almairahs, cupboards, other openings, thickness of roofing, width and depth of parapet wall, lintels, sunshades, portico and other details.
- All these details are required to calculate the quantities of items of work and to execute the process of construction.



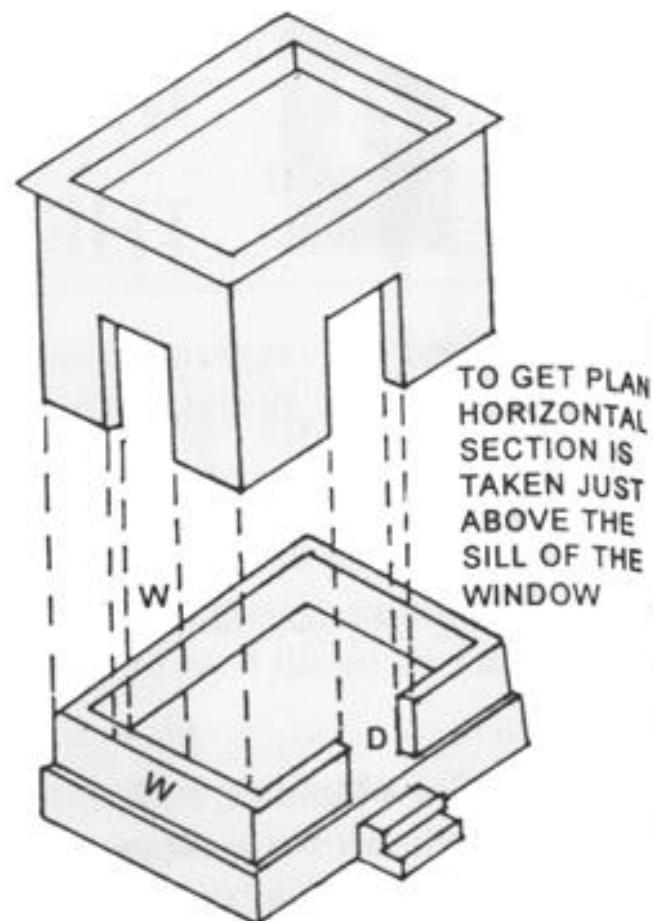
# Elevation

- Elevation or front view is the outward view of a completed building along any side of the building.
- When a building is seen by standing in front of it, the view that can be viewed is known as front elevation. Similarly backside view is called rear elevation or from any side of it which is known as side elevation.

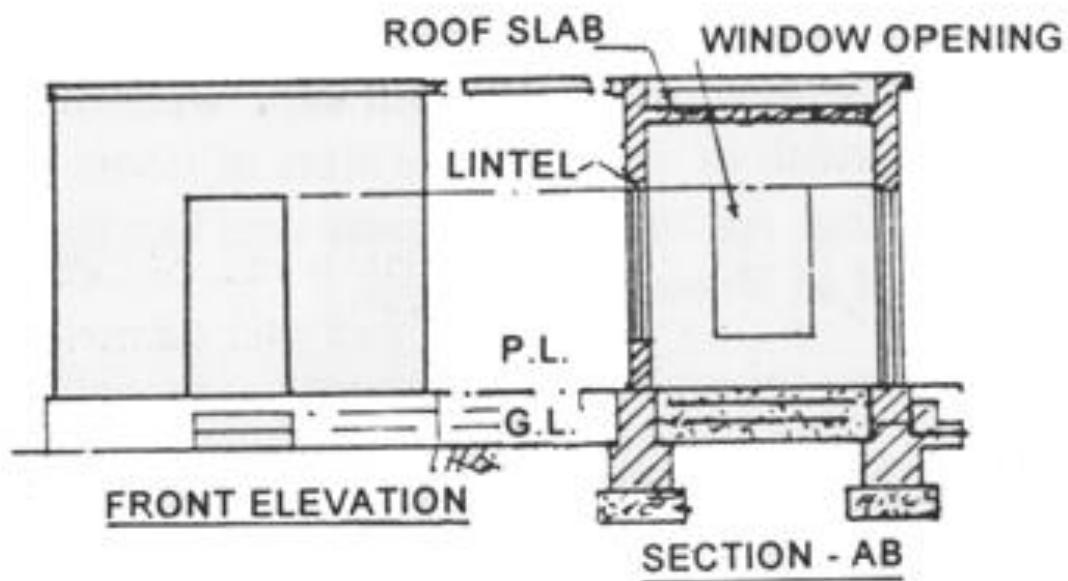
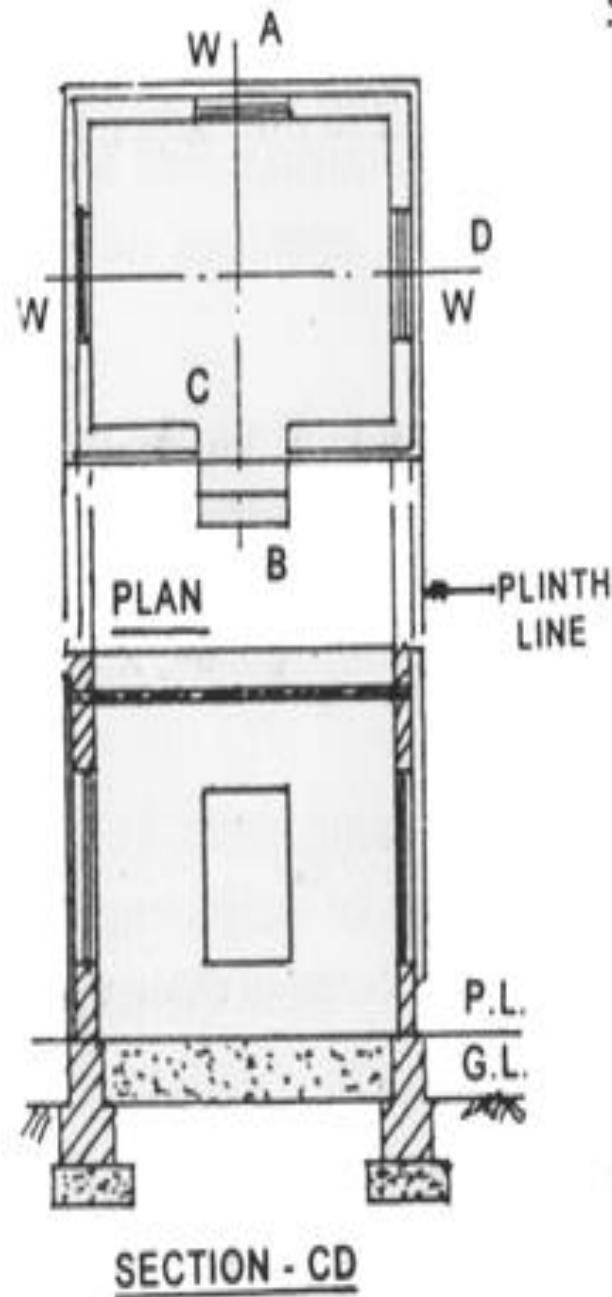


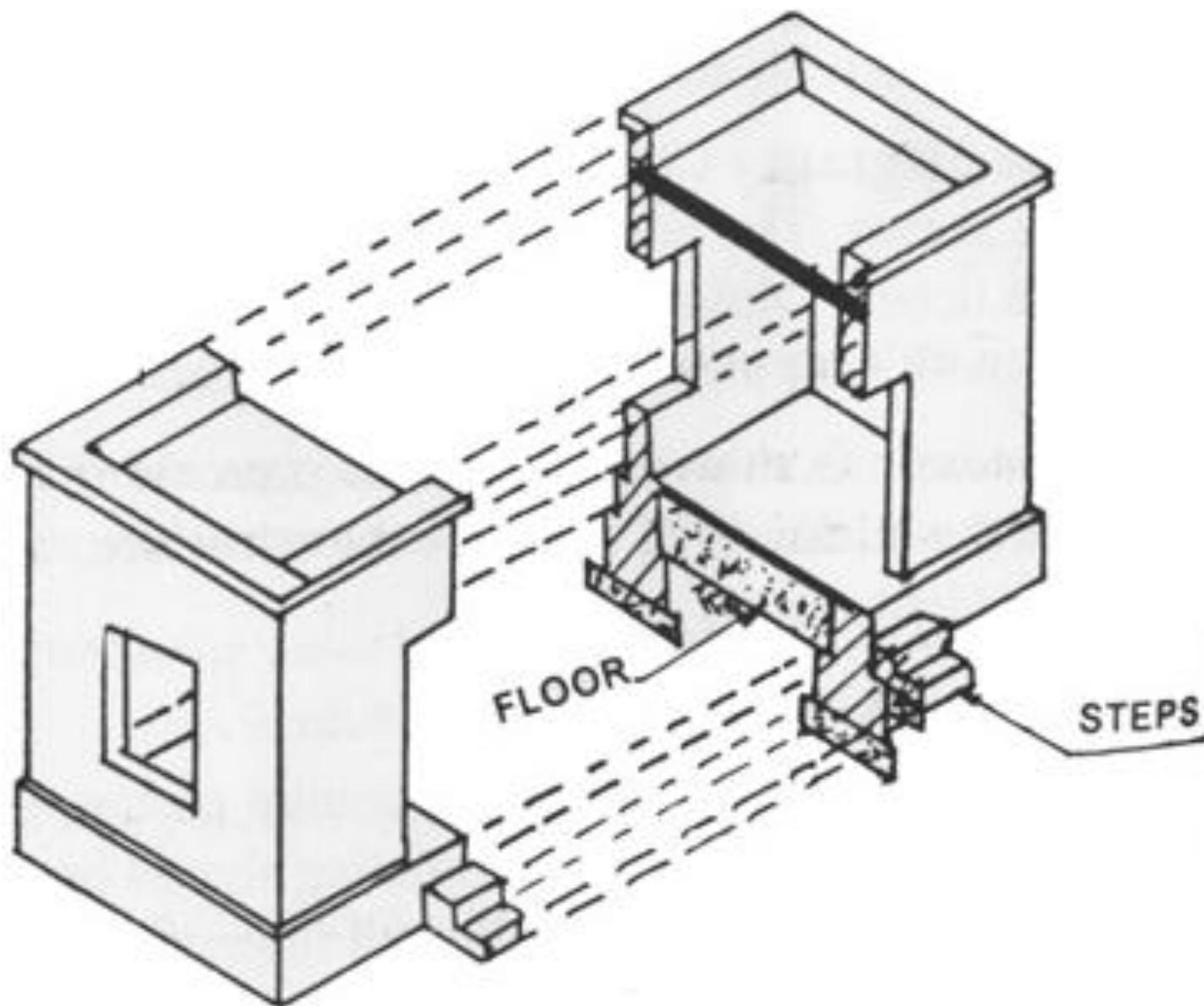


ISOMETRIC VIEW OF A BUILDING



METHOD OF OBTAINING PLAN







# PRINCIPLES OF PLANNING

- Building Planning is the arrangement of various components or units of a building in a systematic manner so as to form a **meaningful and homogeneous** structure to meet its **functional purpose**.
- The arrangement of the **various rooms** in the building is known as **Planning of Building**.
- **Building planning** is a graphical representation of what a building will look like after construction. It is used by **builders and contractors** to construct buildings of all kinds.
- Building planning is also useful when it is **essential to estimate** how much a project will cost and for preparing **project budgets** building planning is also useful.
- The **basic objective of planning** the building is to arrange all the units of the building on all **floors at a given level** according to their **functional requirements**. By doing this, one can make the best use of space **available for building**.

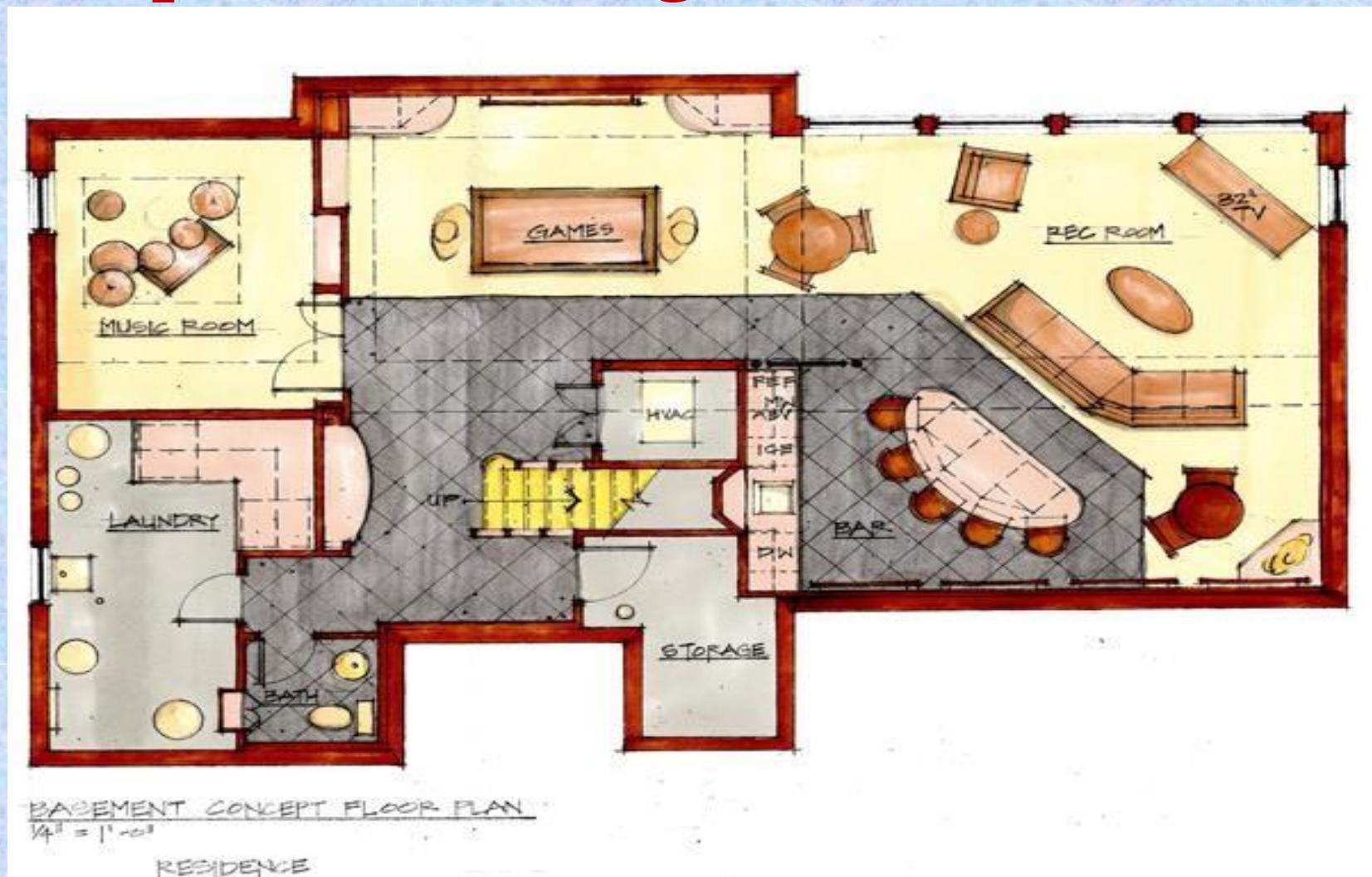
□ In building planning, **privacy** can be obtained by judicious planning of the building with respect to **grouping, the position of doors and windows**, mode of the hanging of doors, location of **entrance and pathways, etc.** sometimes, provision of lobbies, corridors, screens, etc.

## **Factors Affecting to Building Planning**

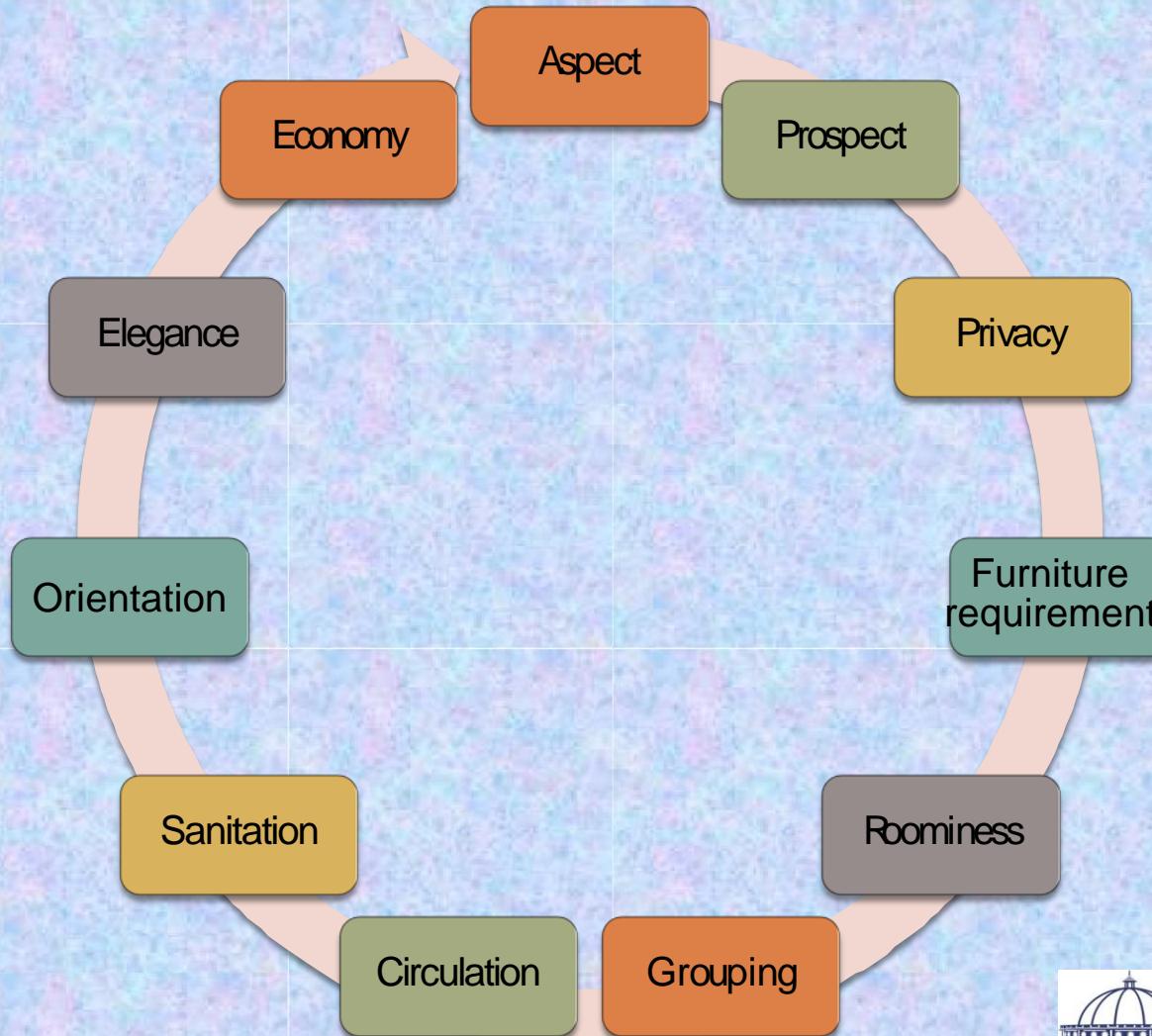
Followings are the factors affecting the planning of the building,

- ❖ Function of building e.g. residential, industrial, public, commercial etc.
- ❖ Shape and size of the plot
- ❖ Topography
- ❖ Climatic condition
- ❖ Building by-Laws etc.

# Principles of Planning

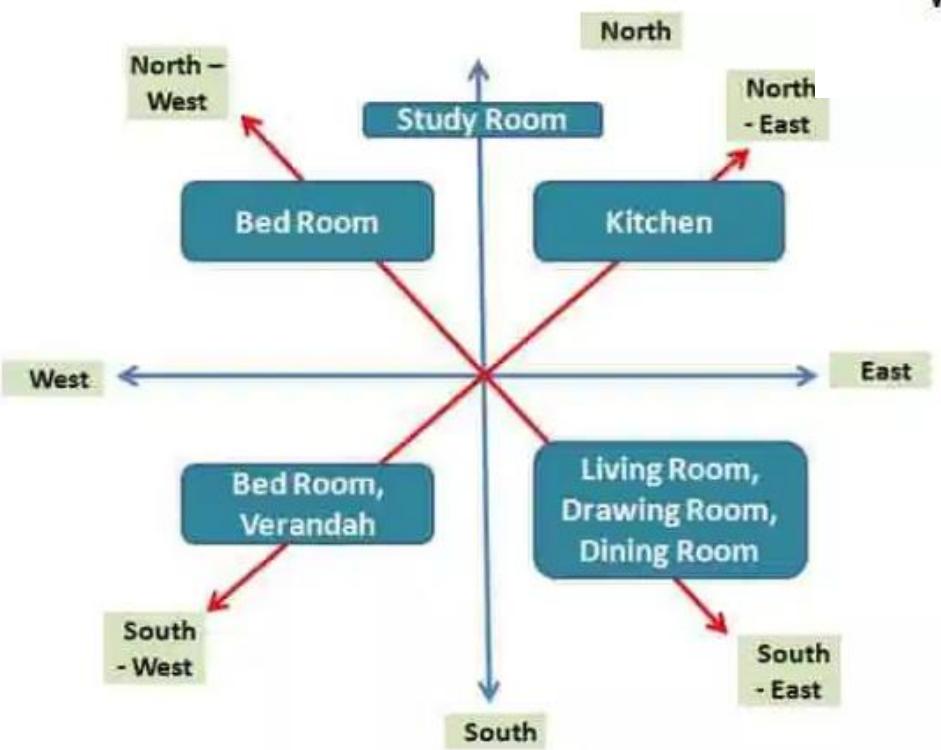
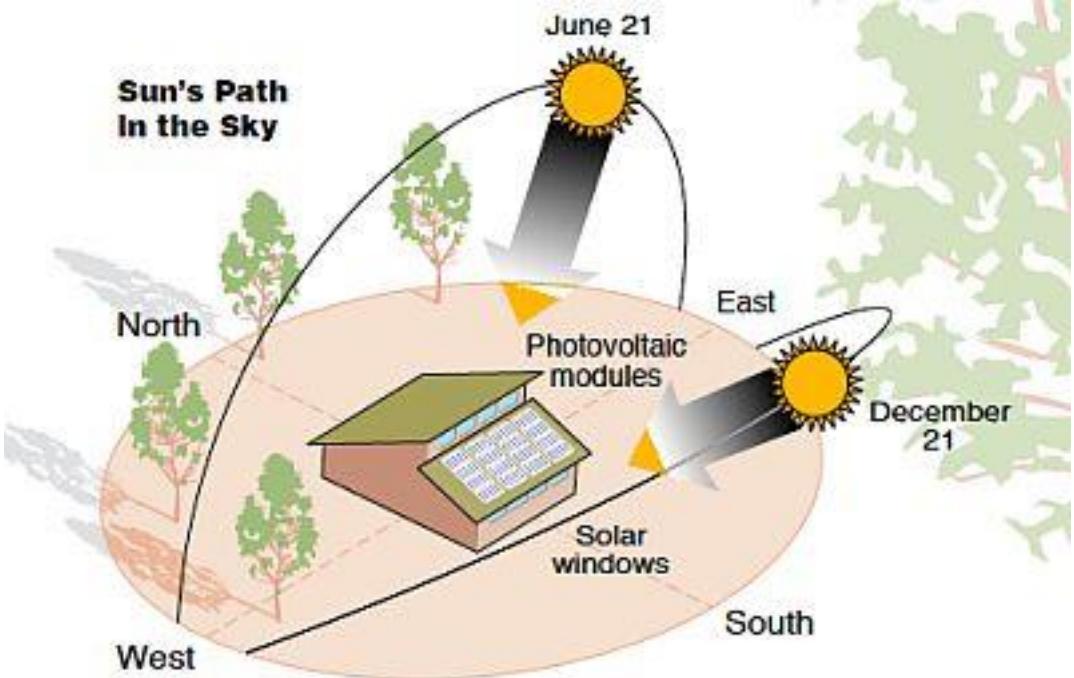
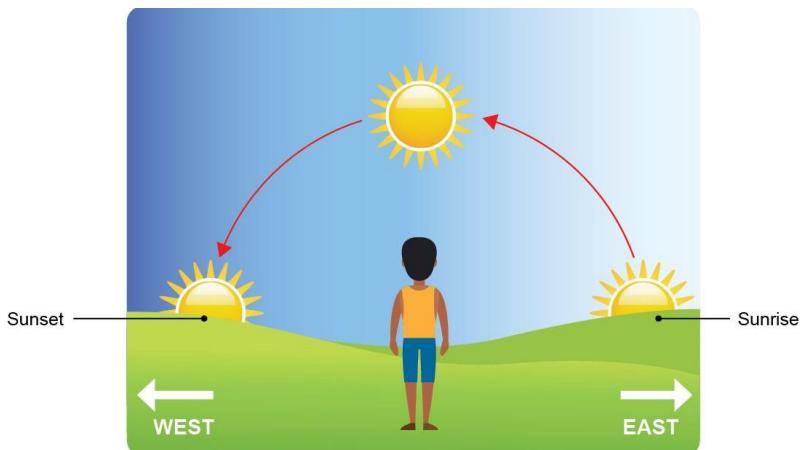


# Principles of Planning (cont.)



# Principles of Planning (cont.)

- **ASPECT:** placement of different rooms of house in accordance with our activities at different hours of day.
- Rooms should get enough sunlight and air, which gives
  - Cheerful atmosphere
  - Comfort
  - Hygienic condition
- A room which receives light & air from particular direction is said to have ‘aspect’ of that direction.

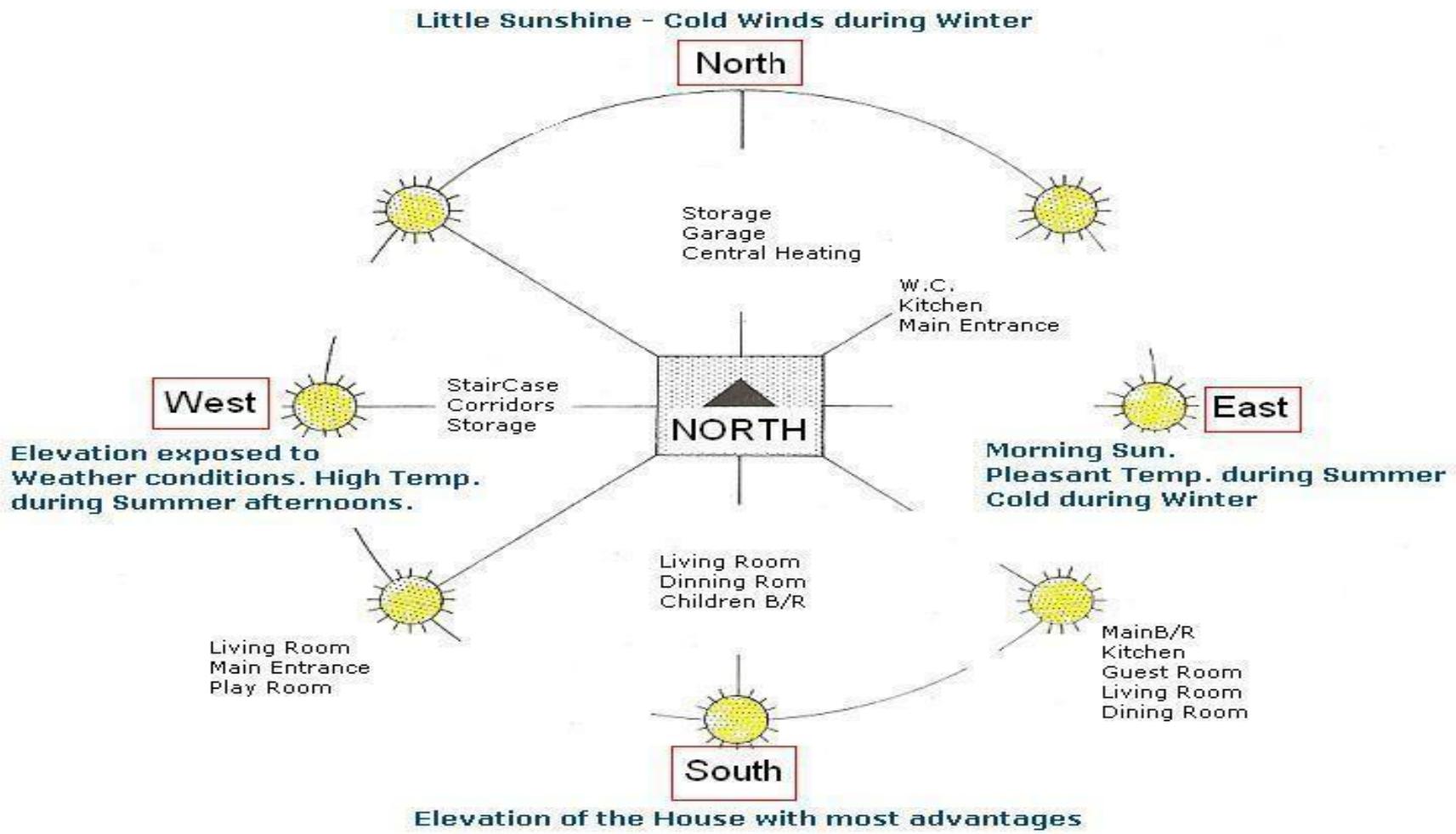


Aspect Diagram  
in Principle of  
Planning

# Principles of Planning (cont.)

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

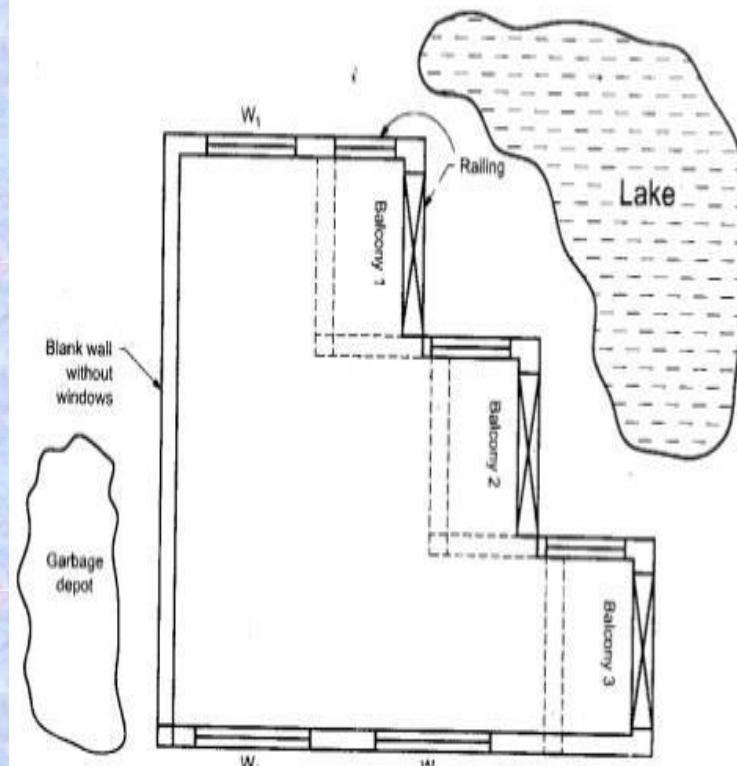
# Sun



# Principles of Planning (cont.)

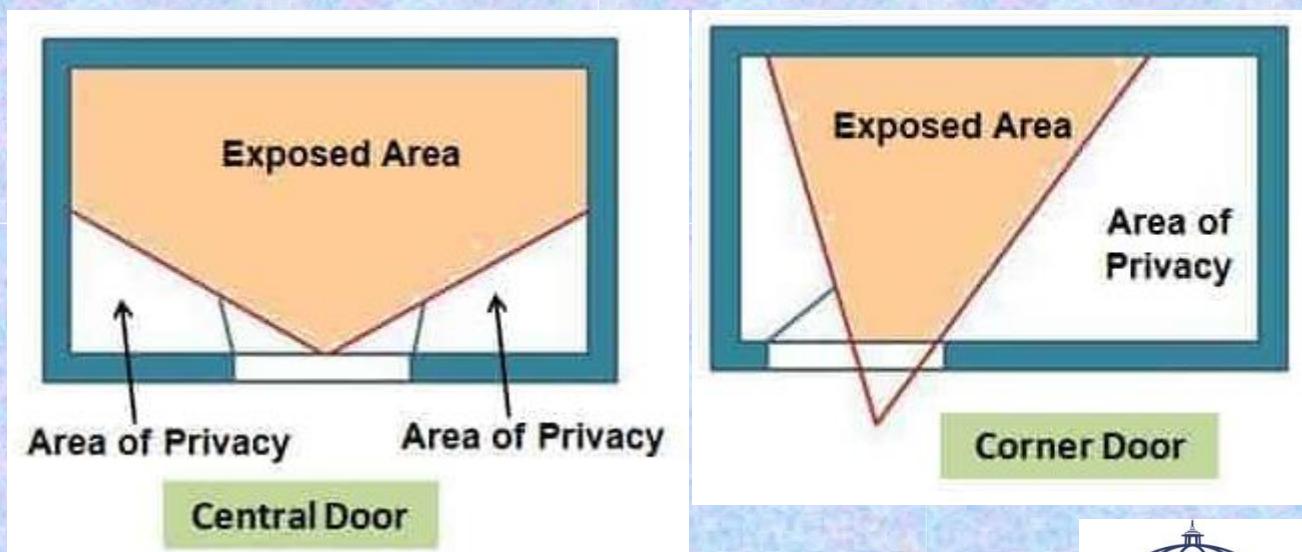
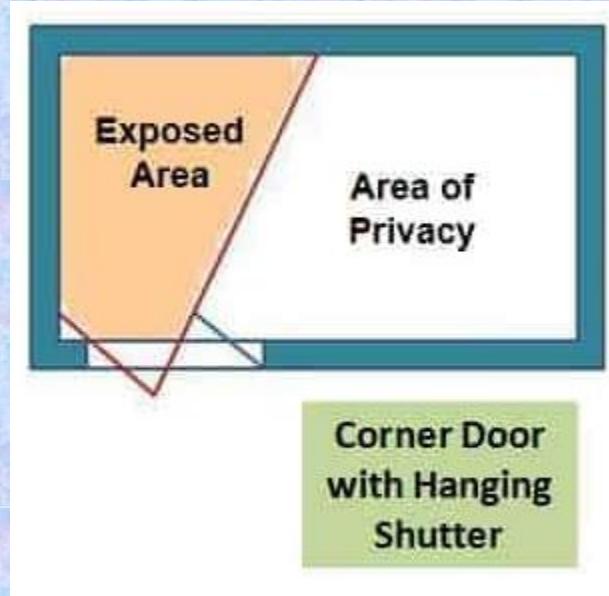
- **PROSPECT:** It refers to view as seen of the outside from the windows and doors in external walls
- ❖ Prospect is dictated by surrounding peculiarities good or bad of the selected site like a flower garden or garbage dumps, It demands the disposition of doors and windows-like aspect. However, a good layout should not be disturbed for the sake of good prospects only.

Prospect: Desirable and undesirable views



# Principles of Planning (cont.)

- **PRIVACY:** privacy can be of
  - Sight (bath, w/c)
  - Sound (confidential discussion, study room)
  - Both sight and sound (bed room)
- It broadly classified into two categories i.e.
  - Internal privacy
  - External privacy



# Principles of Planning (cont.)

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



# Principles of Planning (cont.)

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

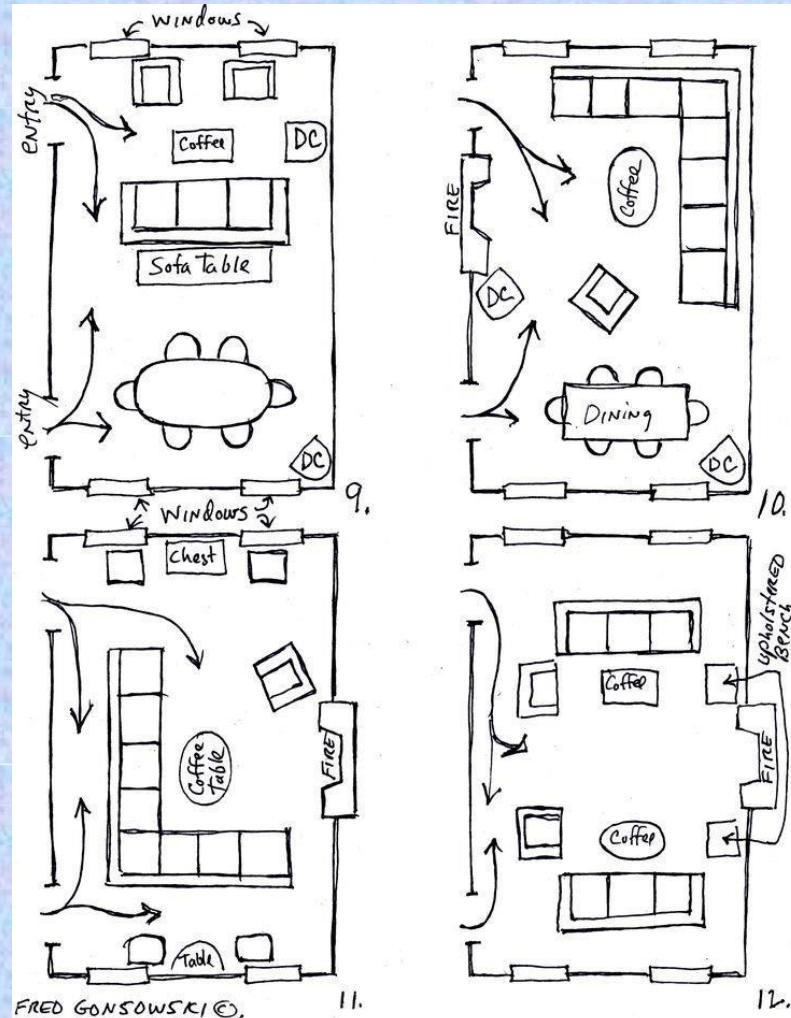


# Principles of Planning (cont.)

## □ FURNITURE REQUIREMENT:

Planner should know how much space is needed by each function

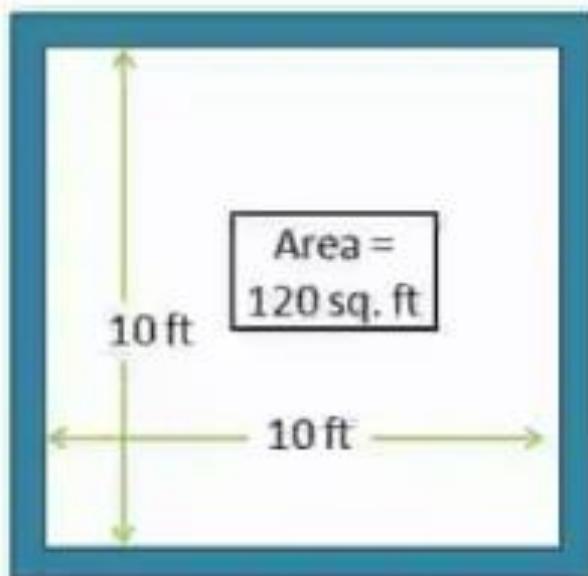
- Room sizes can be completed on basis of
  - ✓ permanent furniture to be used
  - ✓ It's dimensions and arrangement
  - ✓ Clearance for circulation



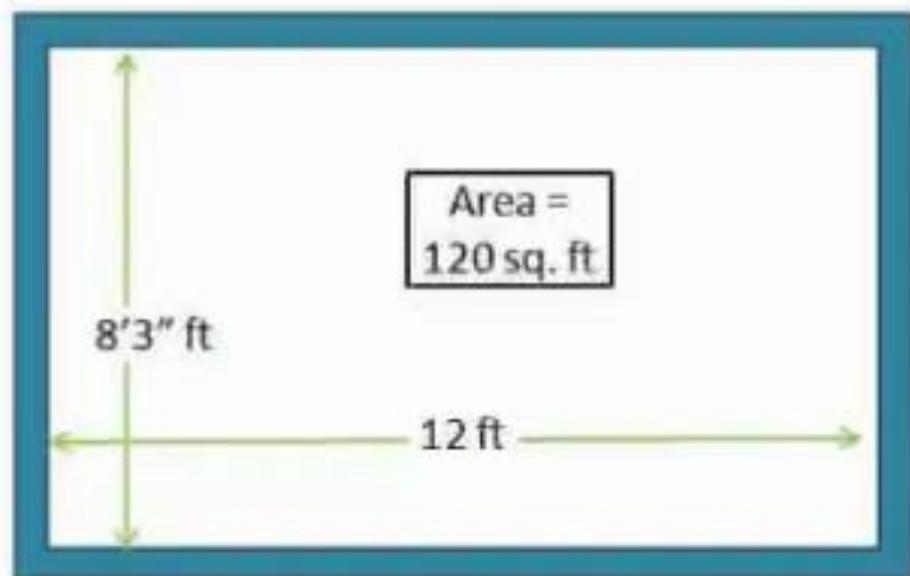


## FURNITURE REQUIREMENT

# ROOMINESS:



1. Square Room



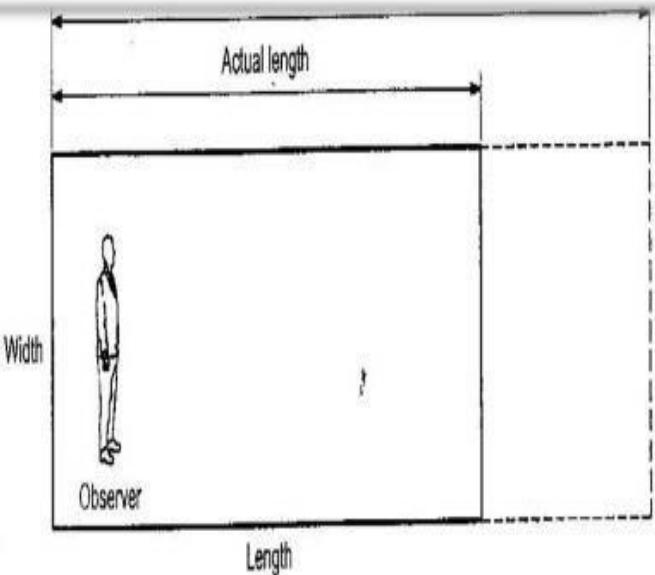
2. Rectangle Room

□ **ROOMINESS:** it is feeling created after a room is well-furnished with all permanent furniture as spacious and well-planned.

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

# Principles of Planning (cont.)

## Roominess : Tunnel Effect



Roominess is greatly influenced by the number and position of doors, windows, lofts and cupboards

Type of curtain can influence roominess

Roominess- head room

Meeting room – ceiling is low- a feeling of close association amongst people

In court or place of worship-ceiling is high- to give a feeling of supremacy



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# Principles of Planning (cont.)

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

- Points to be considered

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



# Principles of Planning (cont.)

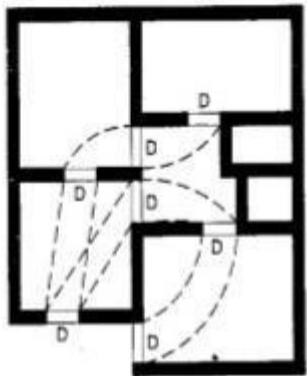
- **CIRCULATION:** it is access into or out of a room, it is internal movement inside a building
- Circulation area shall be straight, short, bright, lighted both day and night, well ventilated and free from obstructions
- It should not affect privacy nor interfere with utility
- It is of two types
  - Horizontal – circulation within same floor
  - Vertical – circulation between different floors



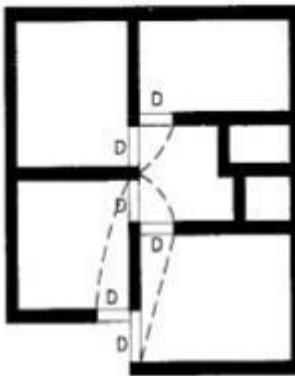
# Principles of Planning (cont.)

## circulation patterns

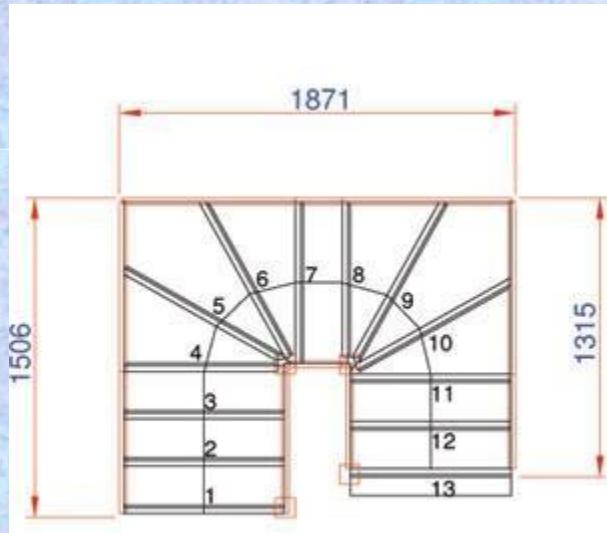
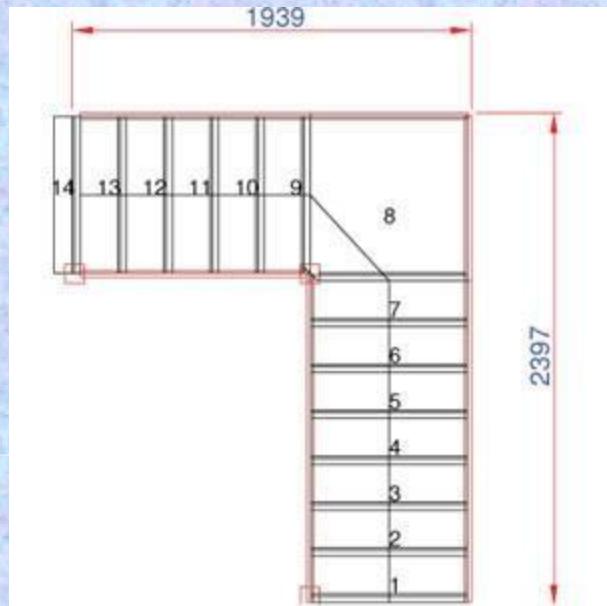
- Horizontal : On the same floor



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

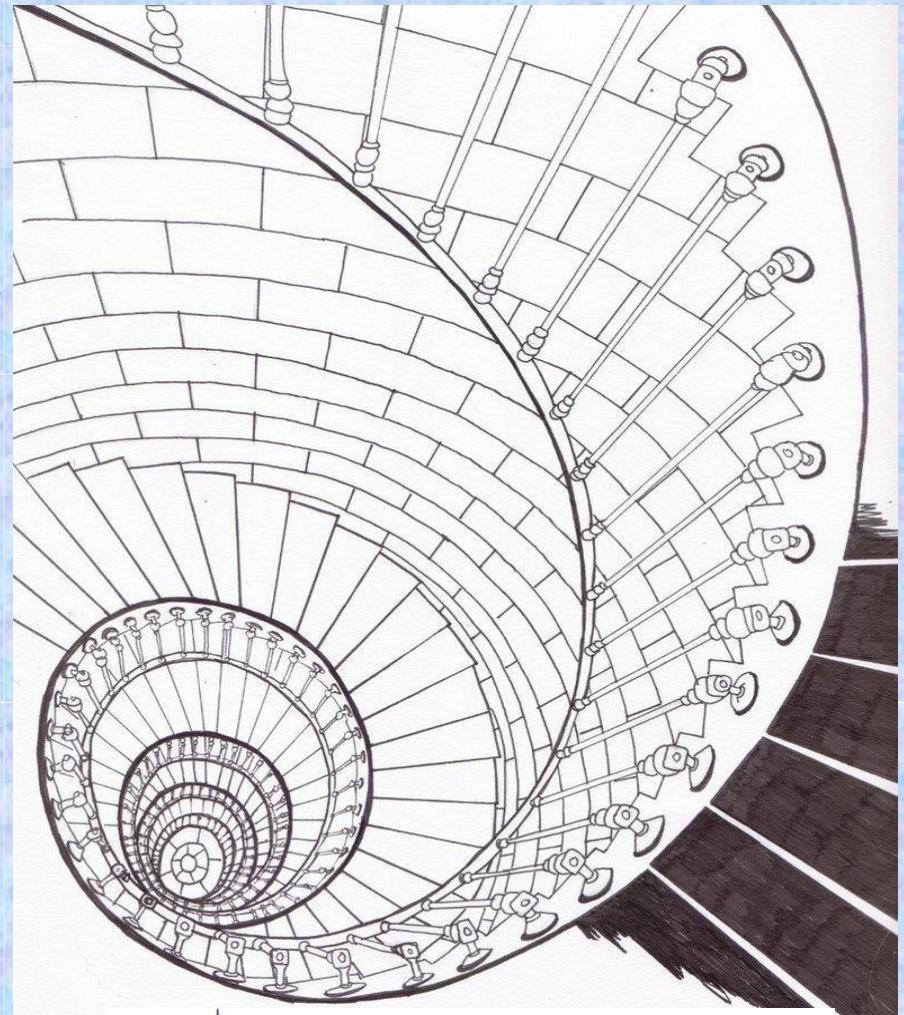


**Correct placement of doors.**  
See the minimum space lost in circulation  
shown by dotted lines. Also rooms are no  
longer divided by circulation.



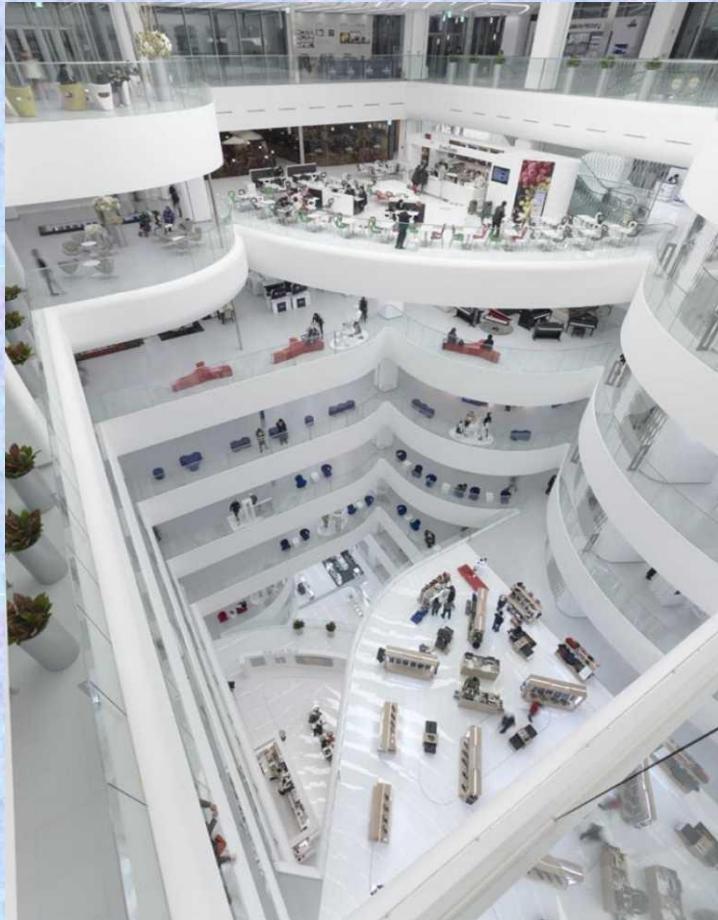
# Principles of Planning (cont.)

## circulation patterns



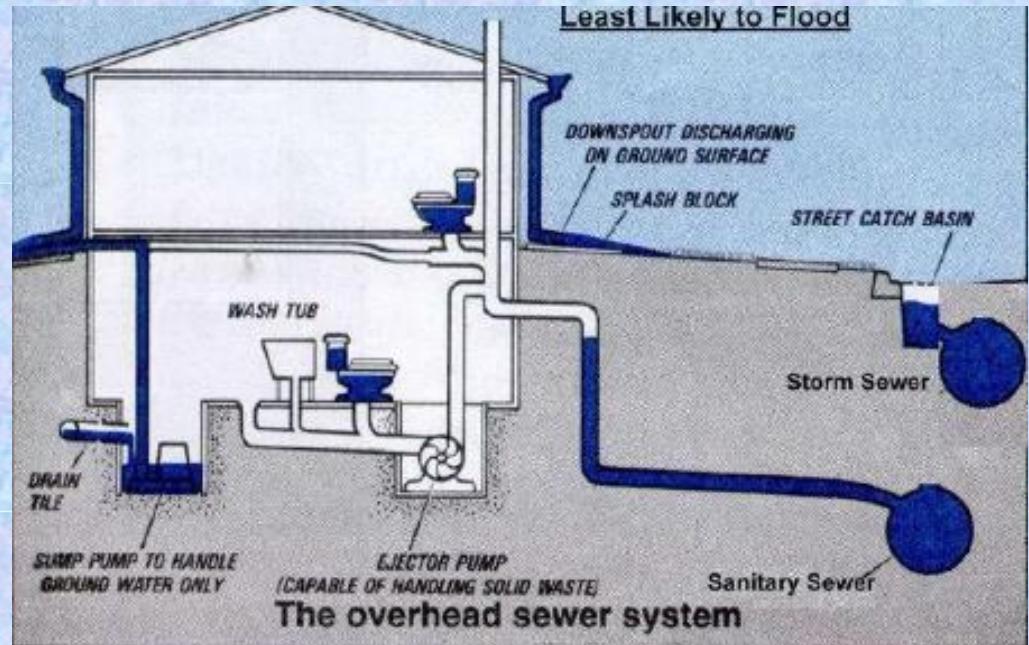
# Principles of Planning (cont.)

## circulation patterns



# Principles of Planning (cont.)

- **SANITATION:** it is provision and upkeep of various components of house to keep inmates cheerful and free from disease
- Factors influence sanitation are
  - Lighting
  - Ventilation
  - Cleanliness
- Lighting: natural sunlight or artificial
  - Intensity of natural light is affected by pollutants like smoke, dirt, dust, gases and clouds
  - Min window area =  $1/7^{\text{th}}$  floor area (hot-humid climate)
  - Min window area =  $1/10^{\text{th}}$  floor area (dry climate)



# Principles of Planning (cont.)

- **Ventilation:** a system of supplying or removing air by natural or mechanical means to or from any enclosed space to create and maintain comfortable condition
- Orientation of building and location of windows help in providing proper ventilation
- Basic requirements in ventilation
  - Sensation of comfort
  - Reduction in humidity
  - Removal of heat
  - Proper supply of oxygen
  - Reduction of dust



# Principles of Planning (cont.)

- There are two methods of ventilation
  - **Natural**: suitable for houses and flats, achieved by designing windows and ventilators opposite to each other.
  - **Artificial**: necessary if room is to be occupied by more than 50 persons or where space per occupant is less than  $3 \text{ m}^3$ , it is achieved by exhaust system of supply system.



# Principles of Planning (cont.)

## □ Cleanliness:

### ○ Dust:

- ✓ Harbours bacteria
- ✓ Creates health problems
- ✓ Makes surfaces dull
- ✓ Floors shall be smooth, impervious, non-absorbing, uniformly sloping

### ○ Dampness:

- ✓ Root cause of infection
- ✓ Walls and floors shall be damp-proof
- ✓ Kitchen, bath and w/c shall be drained off quickly



# Principles of Planning (cont.)



- **ELEGANCE:** is grand appearance of a building, mainly owing to the elevation which in turn depends on plan.
- Depends on
  - Elevated site
  - Architecture
  - Neighbourhood
  - Conformity with nature
  - Adjoining building and relative placement



# Principles of Planning (cont.)

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



# Principles of Planning (cont.)



Elegance



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# Principles of Planning (cont.)



Elegance

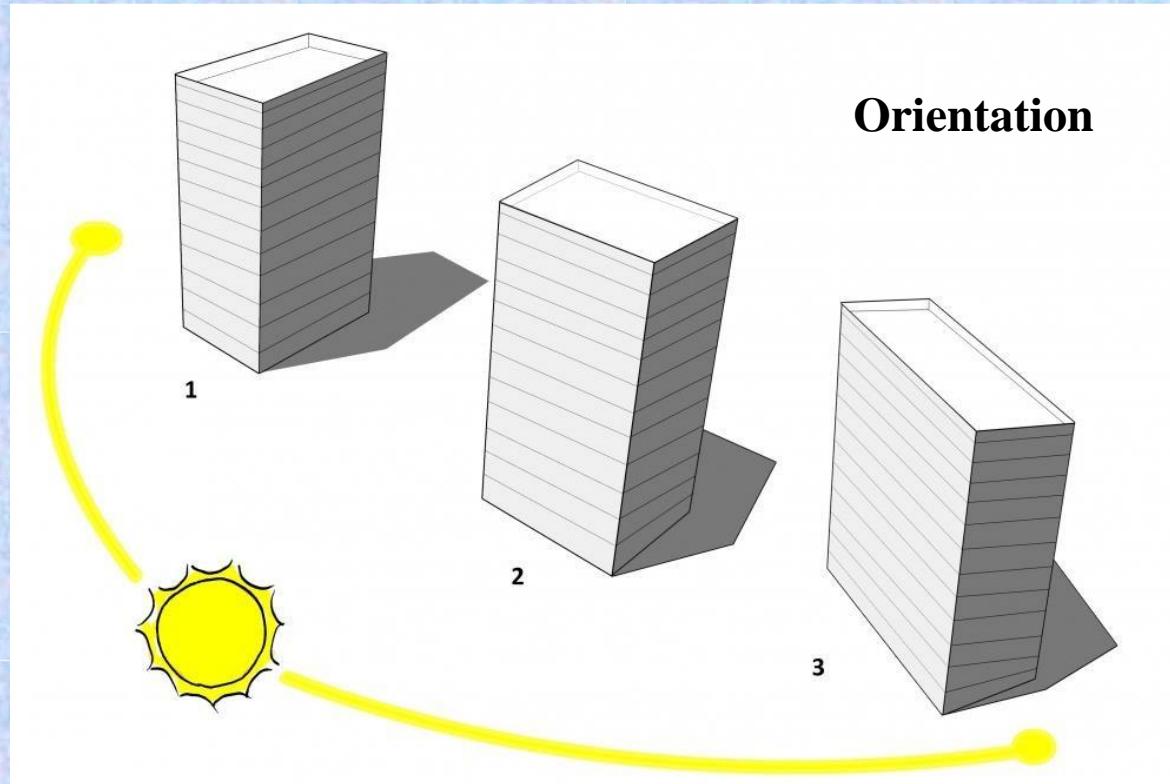


# Principles of Planning (cont.)

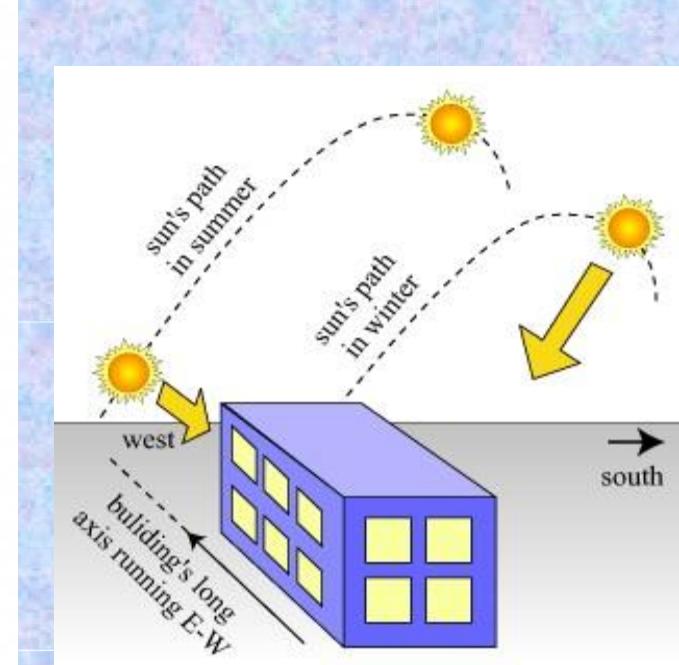
## Orientation

- ❖ Position and direction of building
- ❖ In a school, college or university, orientation preference is given for the class rooms which should not face noisy roads and distracting surroundings. Light and ventilation should be priority
- ❖ For hospitals
  - patient's wards are in use and need to be comfortable position and have privacy too.
  - outdoor patient departments are public oriented, need light and comfort
- ❖ Offices- very densely crowded structures-there should be proper ventilation and prospect for relaxation

# Principles of Planning (cont.)



## Orientation



# Principles of Planning (cont.)

- **ECONOMY:** building should have min floor area with max utility
- It should not achieved at the cost of strength
- Only with proper planning and utility of space being maximized (passage being minimized)
- Can be achieved by,
  - Simple elevation
  - Dispensing of porches, balconies, lobbies
  - Reducing storey height
  - Reducing no of steps of stairs
  - Standardization of sizes of various components and materials



# Building ByeLaws

## Building Bye-Laws:

Min provisions designed from National Building Code (NBC) by town planning authorities/Urban development authorities/Municipalities, to protect the safety of public with regard to structural sufficiency, fire hazards and health aspects



# Building ByeLaws

## Objectives of building bye- laws

- ❖ Disciplined and systematic growth of buildings and towns.
- ❖ Prevent haphazard development
- ❖ Protect safety of public against fire, noise, health hazards and structural failure.
- ❖ Proper utilization of space.
- ❖ Due to it, each building will have proper approaches, light, air and ventilation.
- ❖ Give guideline to architect/engineer in effective planning.
- ❖ To provide health, safety and comfort to people.



# Building Bye Laws

## □ APPLICABILITY of BYE-LAWS:

- New construction:
- Additions and alterations to a building
- Occupancy of building changed
- Development of land
- Any part or whole building is demolished



# Building ByeLaws

## Bye-laws/regulations for different types of building:

- Line of building frontage
- Open spaces around residential building
- Min standard dimensions of building elements
- Provisions for lighting and ventilation
- Provisions for safety from fire and explosion
- Provisions for means of access.
- Sizes of structural elements

- Provisions for drainage and sanitation
- Provisions for safety of works against hazards or accidents
- Requirements for off-street parking spaces
- Requirements for greenbelt and landscaping
- Special requirements for low income group housing



# Building Bye Laws

## 1. BUILDING FRONTAGE:

- it is margin to be left beyond extreme edge of road to front of building line (including excavations for foundation and sunshades/ balcony/ projections of super structures)
  
- i.e. it is the width of clearance of land to be left ‘within the private plot’ to facilitate
  - ✓ Widening of roads in future
  - ✓ More site dist at corners
  - ✓ Minimizing sound pollution
  - ✓ To create a buffer space between public (road) and private (plot) properties



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# Building ByeLaws

## 2. Open space requirement

Open space around the building is required to be provided to meet requirements regarding lighting, ventilation, future expansion and approach

Open space for front, rear and side yards depend upon height of building and can be calculated by the formula.

W = Width of open space around the building in m.

$$W = 3 + (h/10)/3$$

h = ht. of the building in m. < 25m.

Open space = 3 m. When  $h < 10m$ .

But in no case less than 1.8m.



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# Building ByeLaws

## OPEN SPACES

- Residential buildings:  
(up-to 10m height)
  - ✓ Front open space

(Road) Width of street fronting the plot (m)	Front open space minimum (m)
Up to 7.5*	1.5*
7.5 to 18	3.0
18 to 30	4.5
Above 30	6.0



# Building Bye Laws

## ✓ Rear open space:

- Every residential building shall have rear open space
- Avg width = 3 m, At no place less than 1.8 m
- Can be reduced to

**1.5 m for plot width <9m, building ht <7m**

## ✓ Side open space:

- Detached bldg: min 3m either side
- Semi-detached: one side open space 3m  
➤ other side open space can be 1.5m
- Row-type: no side open spaces

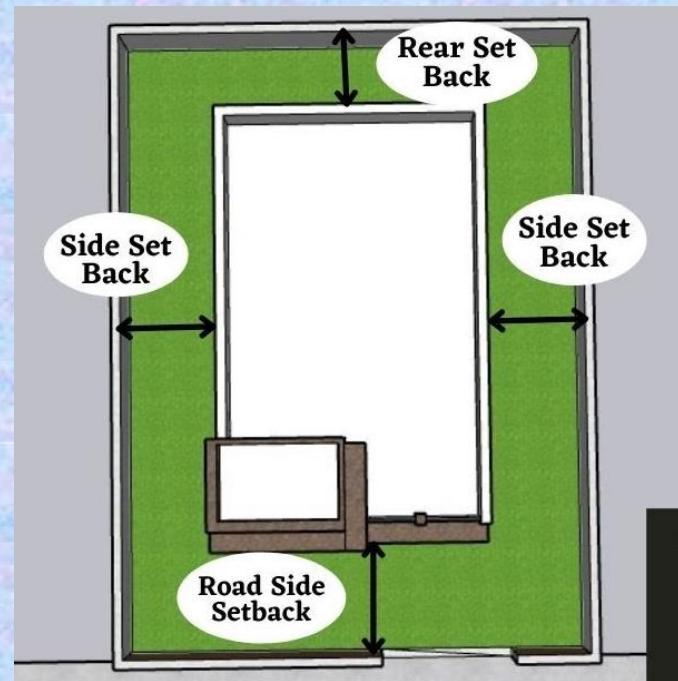


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## 3. Set back distance

- It is the distance measured from centre-line of road upto which plinth of building may extend.
- It is provided to facilitate future road widening, parking of vehicles, free circulation of air etc.
- Setback distance is about 1.5 to 1.67 times more for theatres, commercial complexes, factories than residential building.



Type of road	Minimum Setback Distance		Ratio of column 3 to column 2
	Residential	Industrial	
Village road	9 m	15 m	1.67
Major district road	15 m	24 m	1.60
National or state highway	30 m	45 m	1.50

# Building Bye Laws

- MIN STD DIMENSIONS of BLDG ELEMENTS:
  - Area limitations
  - Ht of the building
  - Plinth ht
  - Requirement of diff types of room
  - Parapet wall
  - Boundary wall

- **Area limitation:** it is achieved by satisfying '*floor area ratio (FAR)/FSI*'
  - ✓ **FAR/FSI = total covered area of all floors(Built up area) / plot area**
  - ✓ For example, if plot size is 15m x 20m, FAR(FSI) is 2.0 then
    - max built-up area on such plot is
    - $5 \times 20 \times 2 = 600 \text{ sq.m}$



# Types of Buildings



**Residential  
Building**



**Educational  
Building**



**Institutional  
Building**



**Assembly  
Building**



**Business  
Building**



# Types of Buildings



Industrial  
Building



Storage  
Building



Hazardous  
Building

**Different types of area:** 1. Built up area; 2. Carpet area; 3. Super built up area      4. Plinth area ; 5. Floor area

1. **Built up area** • “The area covered by the building immediately above the plinth level” • It is also known

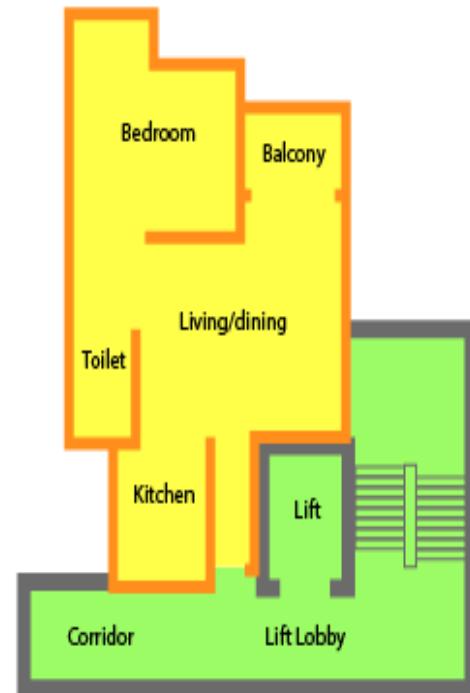


**Carpet**



**Built up Area**

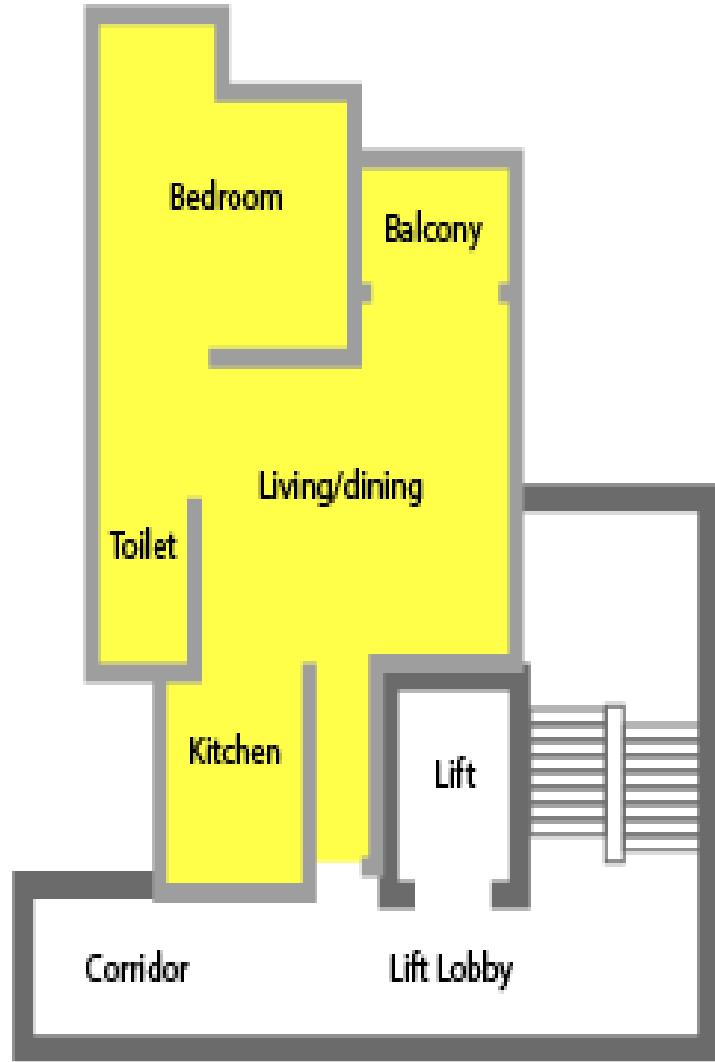
( **Carpet Area + Wall Area** )



**Super Built up Area**

( **Built up Area + Common Access Area** )

2. Carpet area • It is defined as actual area of usable room at any floor level (Literally means the area where carpet can be laid). It does not include sanitary accommodations, verandahs, corridors and passages, stores in domestic buildings, staircases, and shafts for lifts, garages, air condition ducts and plant room.



■ Carpet

- *Areas included in Carpet Area*

- All Rooms – Living Room, Bedrooms, Dining Room, Dressing Room, Other Rooms.
- Kitchen and Bathrooms
- Stores and Balconies

- *Areas not included in Carpet Area*

- External and Internal walls
- Common Areas



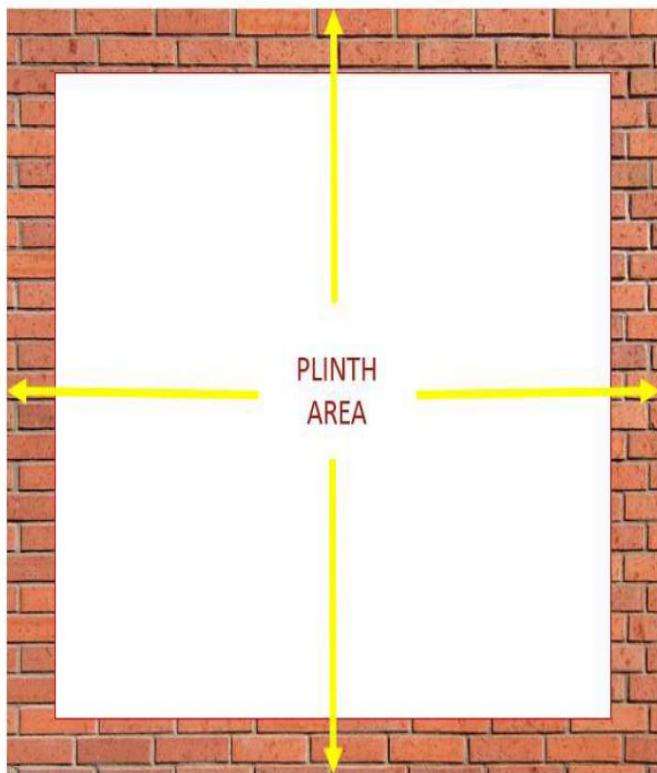
3. Super built up area: The super built-up area is the **total sum of the built-up area and the space occupied by common areas like lobby, staircase, elevator, shafts, clubhouse, etc.**



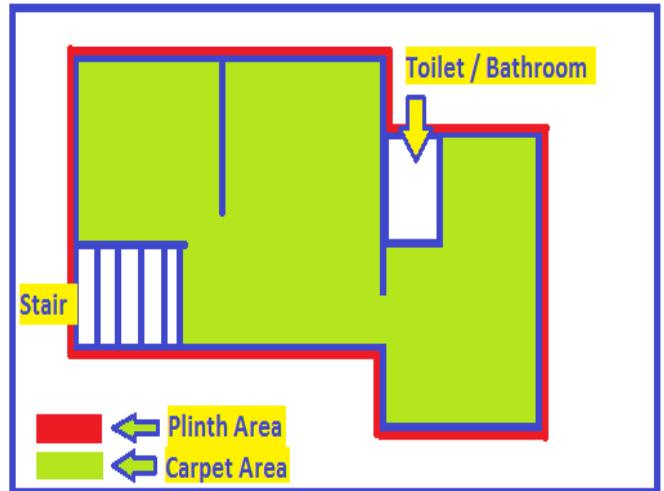
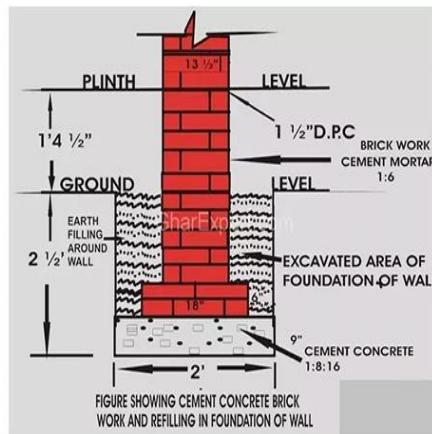
 +  **Super Built up Area**

(  **Built up Area** +  **Common Access Area** )

4. **Plinth Area:** It is the built up covered area measured at the floor level of a building.



## Measurement of Plinth Area





## Carpet Area, Built Up Area and Super Built Up Area

AssetYogi.com



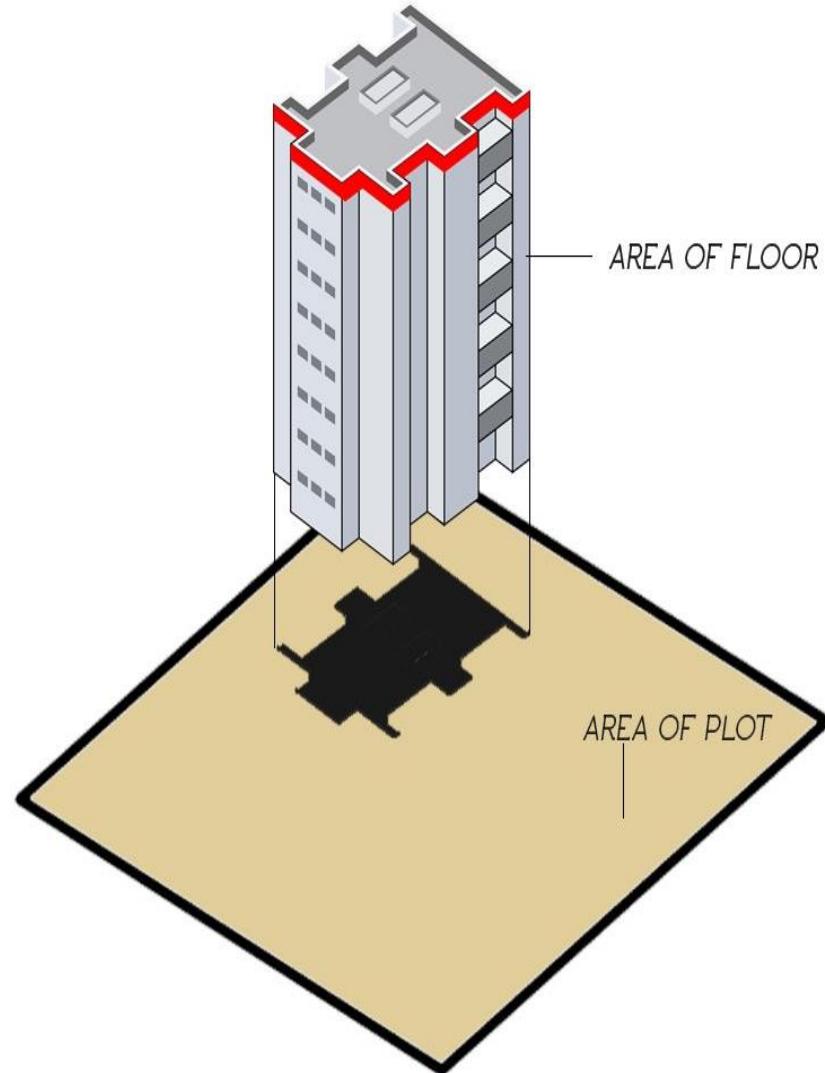
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II विद्यानिर्माणे युगा II

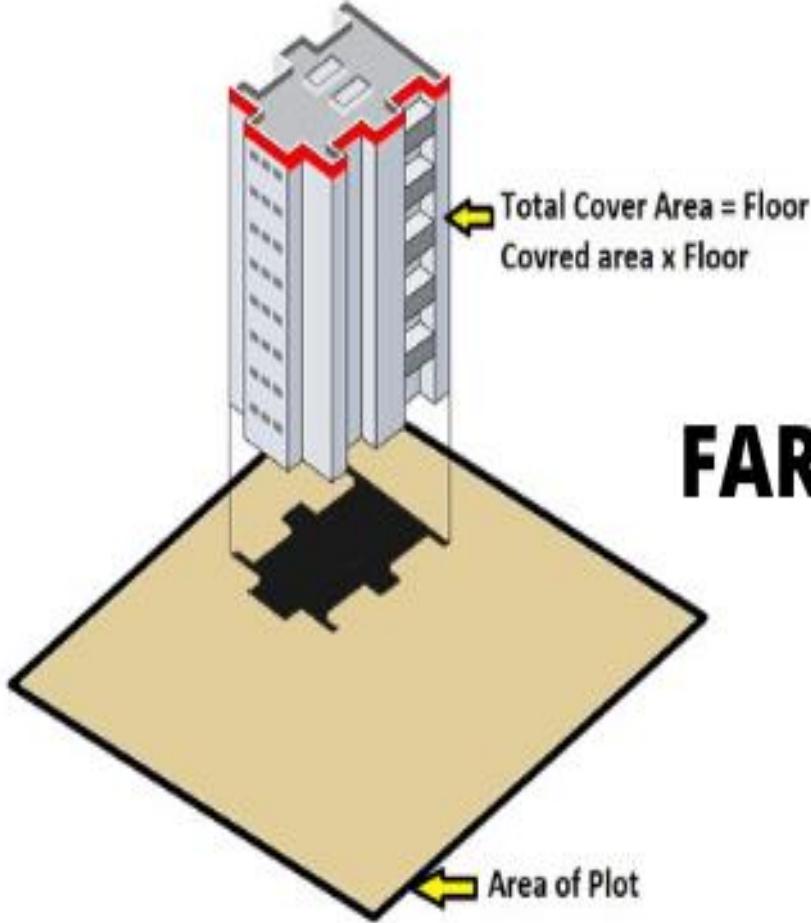
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**5. Floor Area:** It is the usable covered area of the building at any floor level. It including, Porch, Each flat area in single floor for apartment, Stairs, Corridor, door swing place.



## Floor area ratio (FAR), and Floor space Index (FSI)

- To maintain designed population in different parts of the city and to avoid haphazard growth of the city, local authority lays down certain controls on F.A.R., height of the building, total covered area, tenement density, Volume Plot Ratio (V.P.R.) etc.
- Floor area means covered area of a building at any floor level. The quotient obtained by dividing the total floor area on all floors excluding exempted area by the area of plot is called floor area ratio (F.A.R.) or Floor Space Index (F.S.I)
- $F.A.R. \text{ or } F.S.I = \frac{\text{Total covered area on all floors area}}{\text{Plot Area}}$



$$\text{FAR} = \frac{\text{Total Cover Area}}{\text{Area of Plot}}$$

# Problem on

## F.S.I-1

- A plot owner proposed G+1 Storeyed construction with 175 sq.m built up area on each floor .The plot size is 16m X 21 m. Find the ground coverage and FSI proposed ,if all side margins are 2m.If the F.S.I allowed in the area is 1.0, state with reasons whether plan will be sanctioned or not.  
– Ans : F.S.I= 1.04, not sanctioned



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## Solution

- Plot area =  $16 \text{ m} \times 21 \text{ m} = 336 \text{ sq. m.}$
- Total Built up area =  $175 \times 2 = 350 \text{ sq. m.}$
- Ground coverage =  $12 \text{ m} \times 17 \text{ m} = 204 \text{ sq. m.}$
- Proposed FSI =  $350/336 = 1.042$
- FSI proposed > FSI allowed

Ans: - plan will not be sanctioned.

## Problem on F.S.I-2

- Determine carpet area per floor of a two storeyed building from the following data:
    - Plot area=800 sq.m
    - F.S.I Allowed=1.0
    - Ratio of carpet area/built up area= 0.8.
- Assume equal built up area per floor.

**Ans:** 320sq.m

# Solution

- Plot area = 800 sq.m.
- FSI = 1.0
- FSI = Built up area/ Plot area
- Built up area = FSI x plot area  
 $= 1 \times 800$   
 $= 800 \text{ sq. m.}$
- Carpet area/ Built up area = 0.8
- Carpet area = 0.8 x built up area  
 $= 0.8 \times 800$   
 $= 640 \text{ sq.m.}$

Ans :- carpet area per floor =  $640/2 = 320$   
sq.m.

# Problem on F.S.I-3

- Determine the total carpet area of a three storeyed building from the following data:
  - Plot area = 40m X 30m
  - F.S.I Allowed=0.9
  - Ratio of Carpet area to built up area=0.8 **Ans:** 864 sq.m



# Problem on F.S.I-4

- A plot owner proposed G+1 construction with 175 sq.m construction on each floor, on a plot size of 15m X 20m. If all margins are 2m and FSI allowed=1, Find: Ground coverage, F.S.I Consumed, Whether plan will be sanctioned or not. If not, by how much amount the proposed area will be required to be reduced by the owner, so that the proposal will be sanctioned by the authorities.

- Ans:
- F.S.I- 1.17,
- Reduced Area=50 sq.m.

# Green Building

**Definition :-** “It is the practice of increasing efficiency with which buildings use resources- energy, water and materials-while reducing building impacts on human health and the environment.”

**“Green building technology should reach all”**



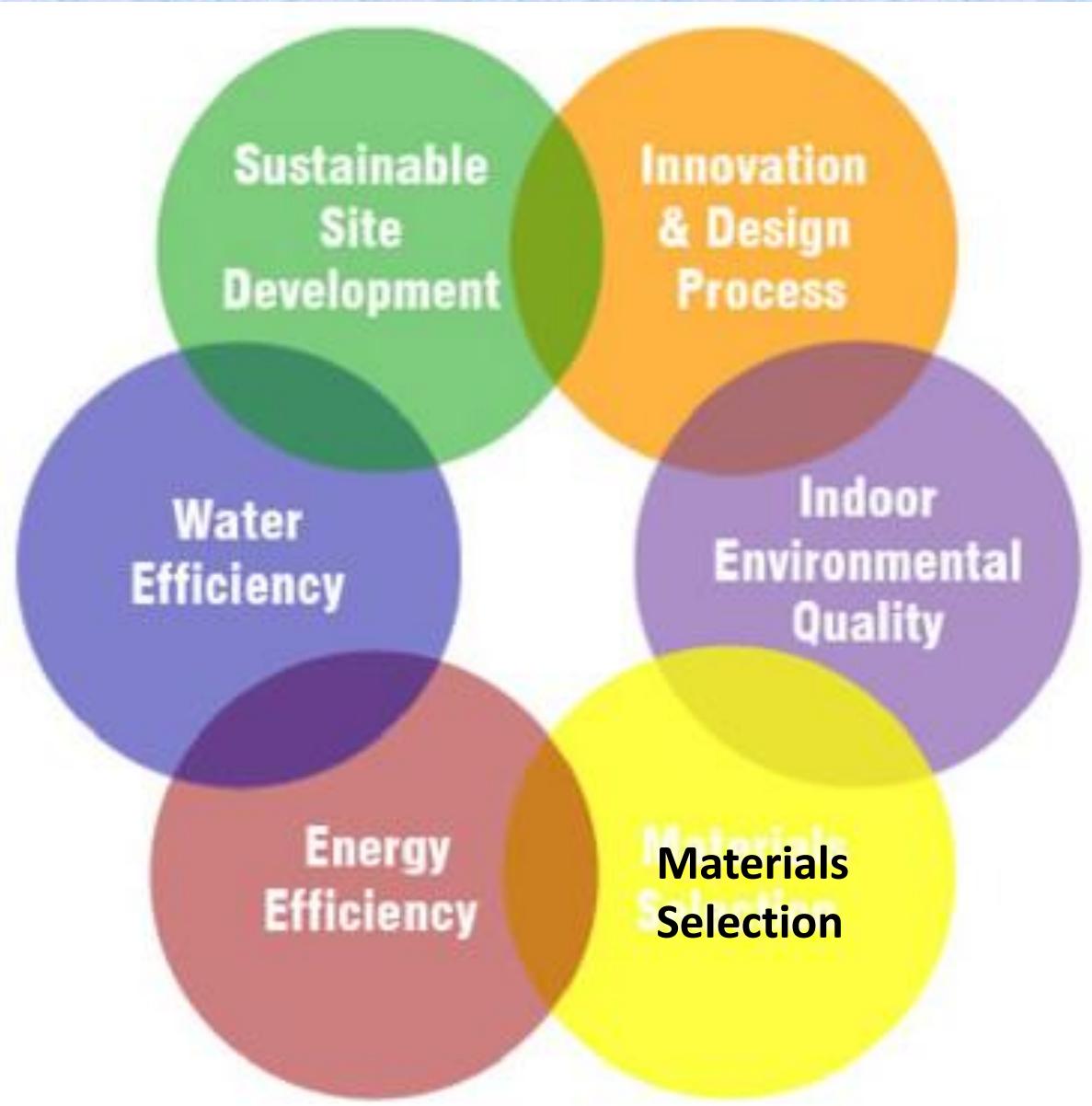
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# Eco Friendly City With Green Building Concept



# Green Building Objectives



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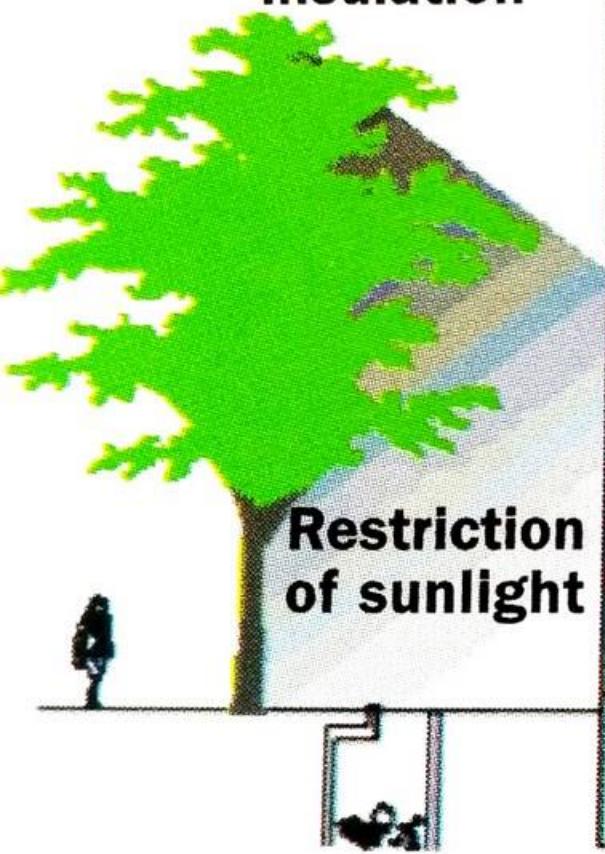




# 10 THINGS TO REMEMBER WHEN DESIGNING A GREEN BUILDING

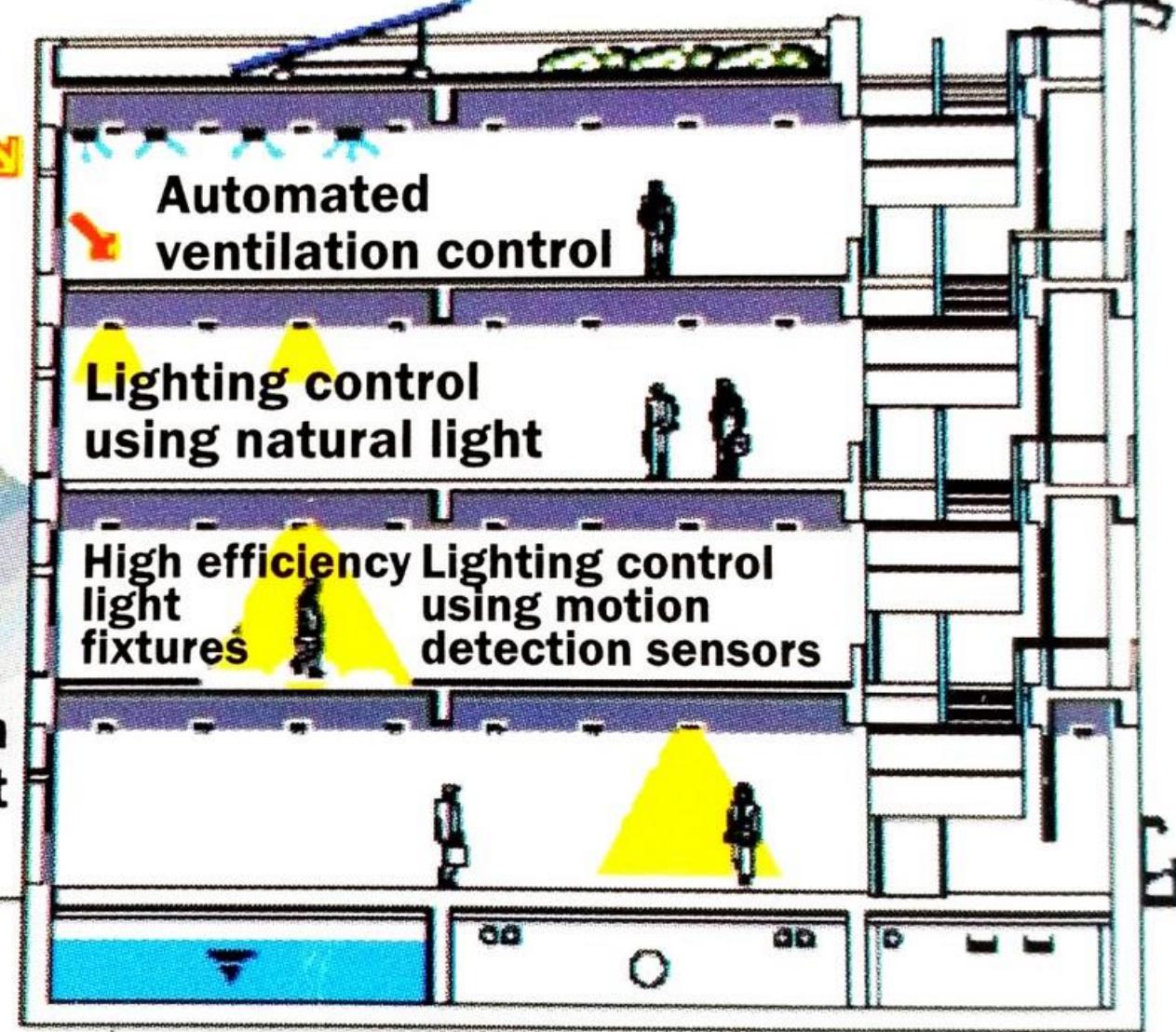


Improving insulation



Photovoltaic generation

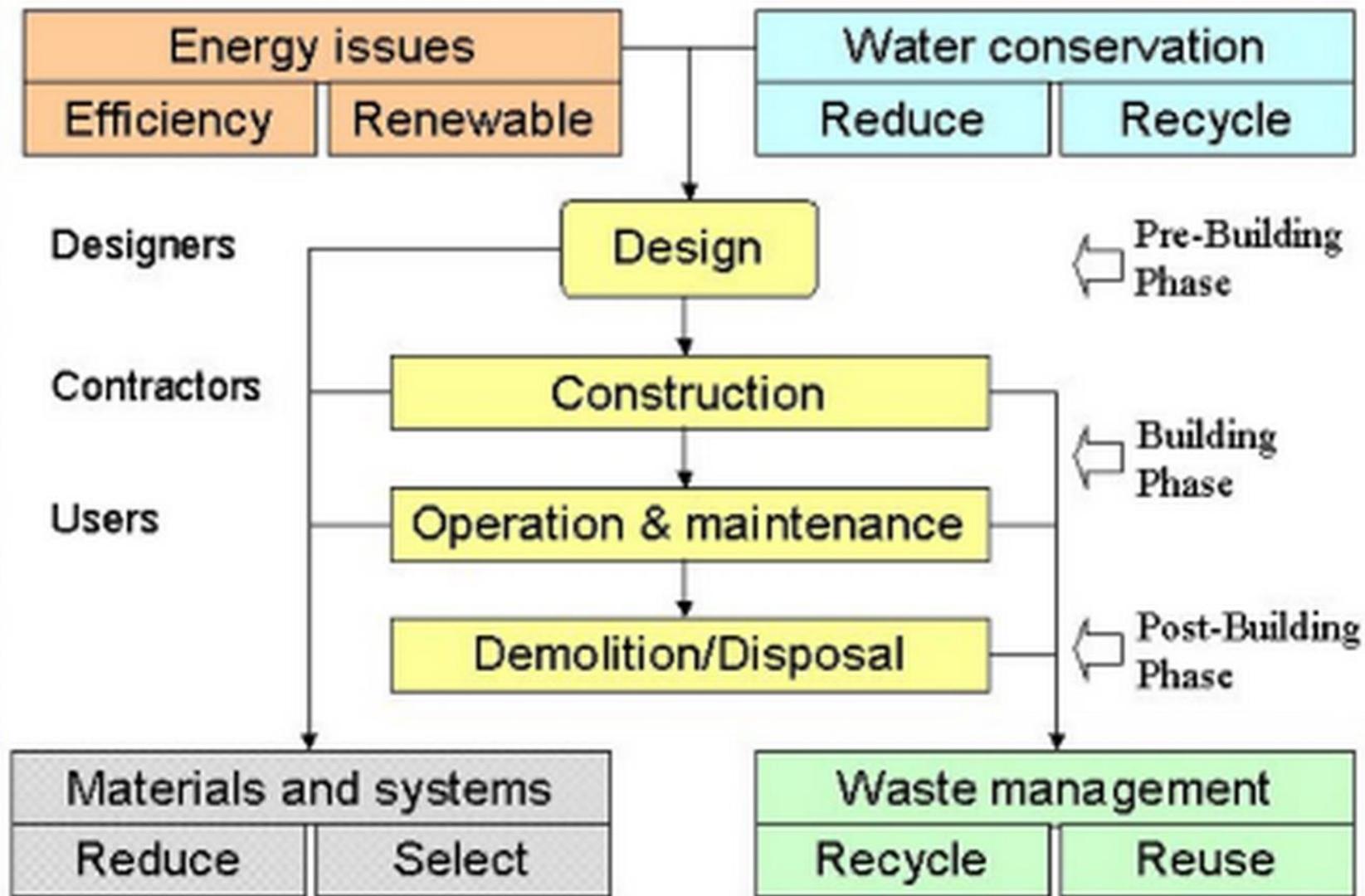
Rooftop planting



Restriction  
of sunlight

Rainwater  
utilization systems

High-efficiency  
heating equipment



- **STRUCTURE EFFICIENCY:**

- It is the concept of sustainable building and has largest impact on cost and performance.
- It aims to minimize the environment impact associated with all life-cycles.



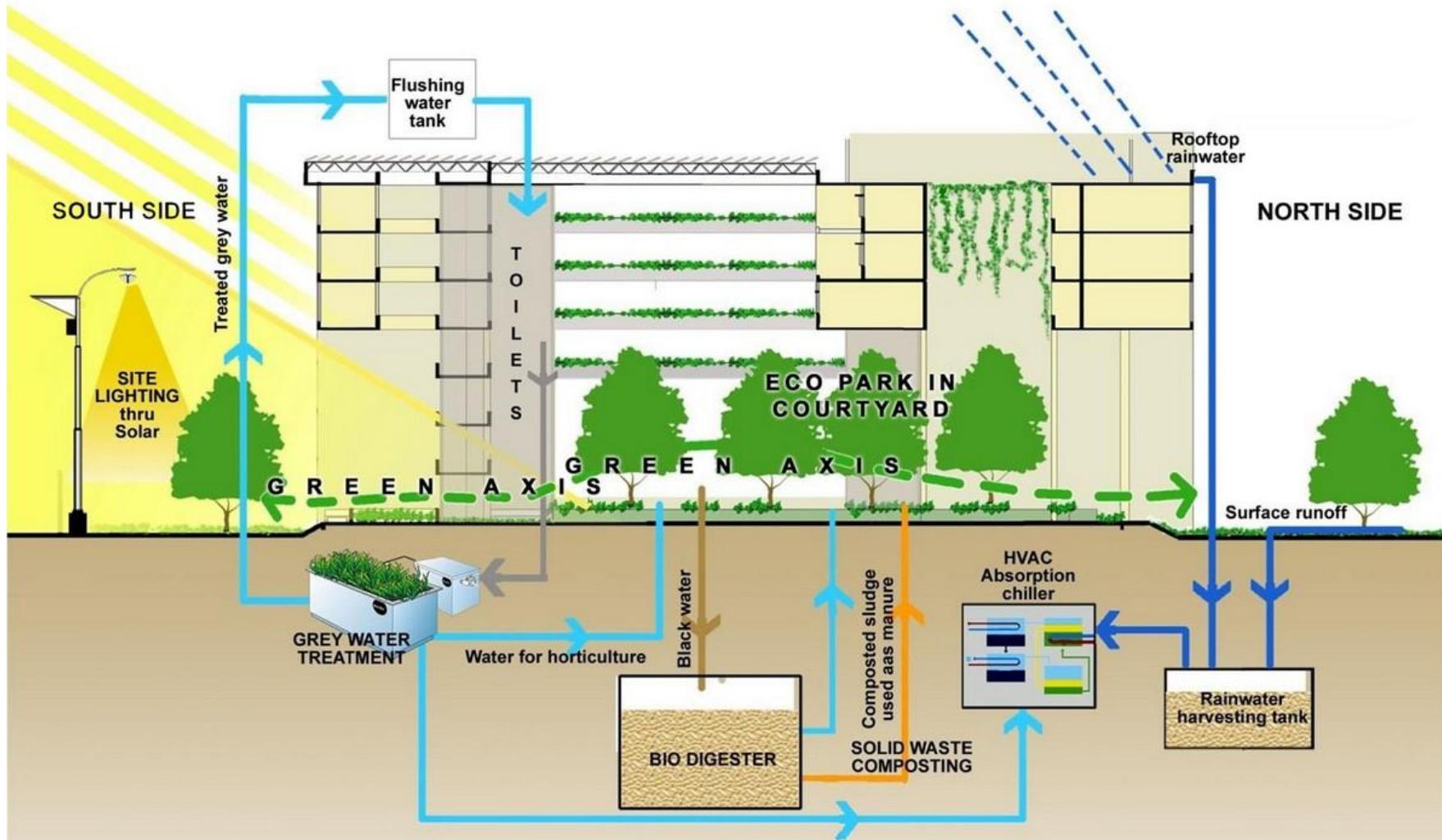
- **ENERGY EFFICIENCY:**

- The layout of the construction can be strategised so that natural light pours in for additional warmth.
- Shading the roof with trees offers an eco-friendly alternative to air conditioning.

- **WATER EFFICIENCY:**

➤ To minimize water consumption one should aim to use the water which has been collected, used, purified and reused.





## SECTION SHOWING WATER MANAGEMENT STRATEGIES

Recycling of waste water through sewage treatment plant; sensor urinals and dual flow cisterns; rain water harvesting.

- **MATERIAL EFFICIENCY:**

- Materials should be used that can be recycled and can generate surplus amount of energy.
- An example of this are solar power panels, not only they provide lighting but they are also a useful energy source.



- **WASTE AND REDUCTION:**

- It is possible to reuse resources.
- What may be waste to us may have another benefit to something else.

# Green Building

## Materials efficiency

- Green building materials are composed of renewable, rather than nonrenewable resources. Green materials are environmentally responsible because impacts are considered over the life of the product. Depending upon project-specific goals, an assessment of green materials may involve an evaluation of one or more of the criteria listed below.
- **Green building material/product selection criteria :**
  - Resource efficiency
  - Indoor air quality
  - Energy efficiency
  - Water conservation



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# Resource Efficiency

- **Recycled Content:** Products with identifiable recycled content, including postindustrial content with a preference for post consumer content.
- **Resource efficient manufacturing process:** Products manufactured with resource-efficient processes including reducing energy consumption, minimizing waste (recycled, recyclable and or source reduced product packaging), and reducing greenhouse gases.
- **Locally available:** Building materials, components, and systems found locally or regionally saving energy and resources in transportation to the project site.
- **Durable:** Materials that are longer lasting or are comparable to conventional products with long life expectancies.

# 10 Smart Ways to Make your Home Eco-Friendly

1) Eco-Friendly Building Materials



2) LED Lighting



3) Solar Panels



4) Household Water Conversion



5) Wind Turbines



6) Harness Geothermal Energy



7) Sustainable Insulation



8) Energy Efficient Appliances



9) Water Re-use



10) Rainwater Harvesting



# Indian Green Building Council

- The Indian Green Building Council (IGBC), was formed in the year 2001 by Confederation of Indian Industry (CII). The vision of the council is to usher in a green building movement in India and facilitate India to become one of the global leaders in green buildings by 2015.
- With a modest beginning of 20,000 sq ft (1,900 m<sup>2</sup>). green built-up area in the country in the year 2003, today more than 1053 green buildings (*as on April 2011*) with a built-up area of over 648,000,000 sq ft (60,200,000 m<sup>2</sup>). are being constructed all over India, of which 147 green buildings are certified and fully functional
- LEED India for New Construction
- LEED India for Core and Shell
- IGBC Green Homes
- IGBC Green Factory Building
- IGBC Green SEZ
- IGBC Green Townships



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# Green Building

## IGBC RATING SYSTEM

- IGBC has developed green building rating programmes to cover commercial, residential, factory buildings, etc.
- Each rating system divided into different levels of certification are as follows:
  - ‘Certified’ to recognise best practices.
  - ‘Silver’ to recognise outstanding performance.
  - ‘Gold’ to recognise national excellence.
  - ‘Platinum’ to recognise global leadership.



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# LEED

- LEED – **Leadership in Energy and Environmental Design** which is a certification process that provides verification that a building is environmentally sustainable.
- LEED is a rating system developed by United State Green Building Council (USGBC).
- LEED is the most widely used green building rating system in the world, community and home project types.

# Rating System

- Site Planning
- Water Management Energy Management
- Material Use
- Indoor Air Quality
- Innovation and Design Process

# Types of Building Quality Certification

- Certified – 40-49 Points
- Silver – 50-59 Points
- Gold – 60-79 Points
- Platinum – 80 points and above

# Green Buildings Project in India

# Rajiv Gandhi International Airport, Hyderabad | Green Buildings in India



## Suzlon One Earth Campus, Pune



# Suzlon ‘one earth’

- One Earth is one of only five buildings in India to be LEED rated and the first in the state of Maharashtra. It is also the only building in India with the highest ratings from LEED (Platinum rating with 57 points which it obtained in 2010) and GRIHA (Five Star rating with 96 points).
- A hybrid wind (80%)- solar (20%); through photovoltaic pane
- 100% rainwater is harvested, 100% of grey water
- Essential resources such as printers, fax machines, Storage cabinets, the pantry etc., are located to minimize unproductive movement.



## Infinity Benchmark, Kolkata



# The ITC Green Centre, Gurgaon | Green Building India



# **Infosys Limited, Mysore**



# Green Buildings Project in India

- Suzlon Energy Limited-Pune
- Biodiversity Conservation India-Bangalore
- Olympia Technology Park-Chennai
- ITC Green Centre-Gurgaon
- The Druk White Lotus School-Ladakh
- Doon School-Dehradun
- Raintree Hotels-Chennai
- Nokia-Gurgaon



# Green Buildings Project in India

- Rajiv Gandhi International Airport-Hyderabad
- Hiranandini-BG House, Powai
- ABN Amro Bank, Chennai
- Palais Royale at Worli, Mumbai
- Punjab Forest Complex,Mohali



# Green Buildings Project in India

- **SUZLON ENERGY LIMITED,PUNE:**

- Several accolades continue to shower upon Suzlon's global headquarter in Pune "One Earth".
- LEED certified it as 'PLATINUM' and it is built on an area of 10.13acres.
- One Earth can be counted as among the largest green building projects in India.



# Green Buildings Project in

- **NOKIA-GURGAON:**
  - ‘GOLD’ rated building by LEED.
  - Its smart lighting, heat recovery wheel and high efficiency chillers makes this office stand out from the rest.



# Top 10 green buildings in India

1. ITC Green Building, Gurgaon(LEED Platinum)
2. Suzlon One Earth, Pune (LEED Platinum), 5 star GRIHA
3. Patni (I-GATE) knowledge Center, Noida (LEED Platinum)
4. Olympia Tech Park, Chennai (LEED Largest Gold)
5. Infinity Benchmark, Kolkata (LEED Platinum)
6. CRISIL House, Mumbai
7. Indira Paryavaran Bhavan, New Delhi (LEED Platinum) 5 star GRIHA
8. ITC Maurya Hotel, New Delhi (LEED Platinum)
9. Infosys, Hyderabad.(LEED Platinum for software development block 1,2,3)
10. CISCO Building, Bangalore (LEED Platinum)

