

CIV101 - BASIC CIVIL ENGINEERING

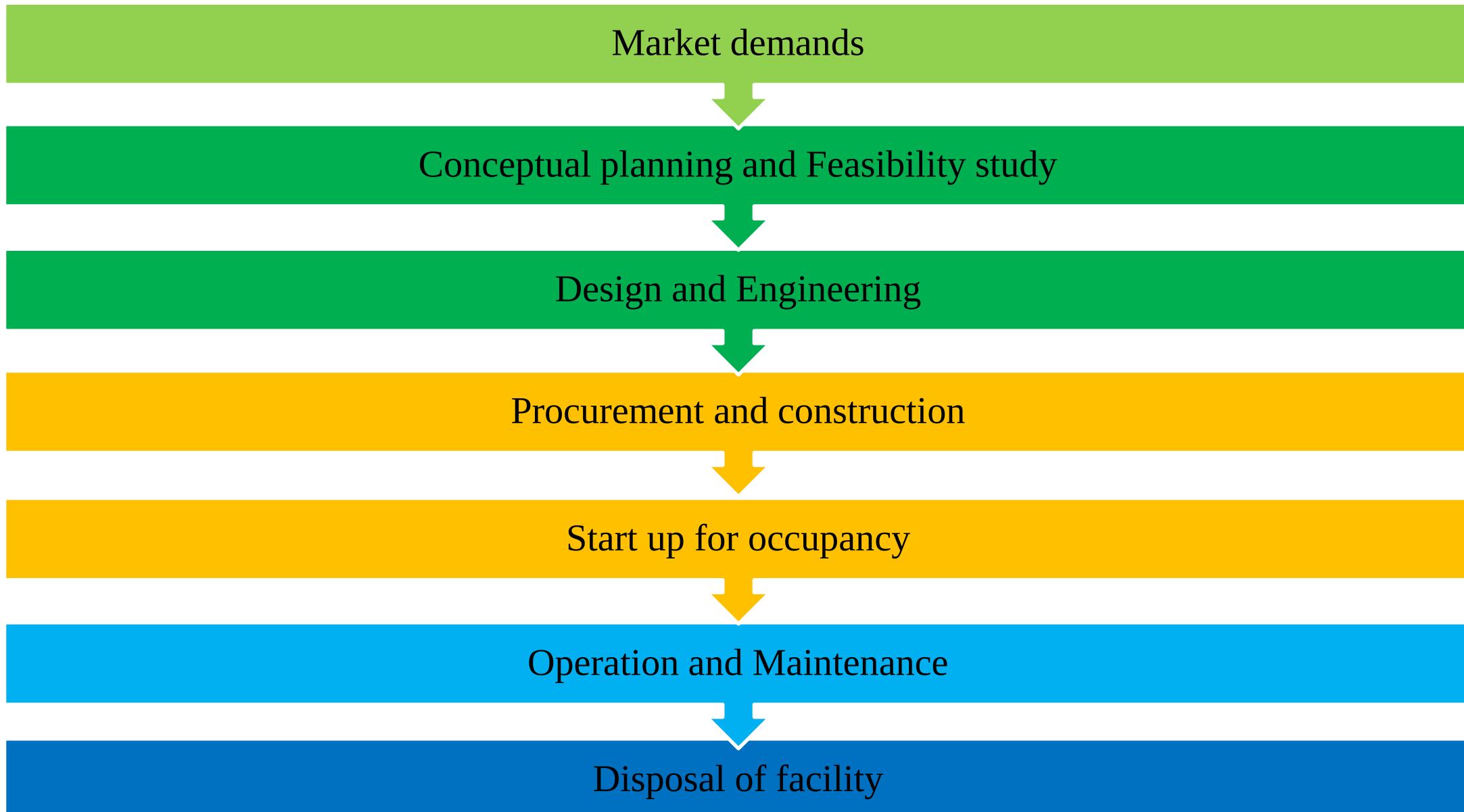
Functions of Civil Engineering and its Branches of

V.Rathinakumar ,
Assistant Professor
School of Civil Engineering
SASTRA University

FUNCTIONS OF A CIVIL ENGINEER

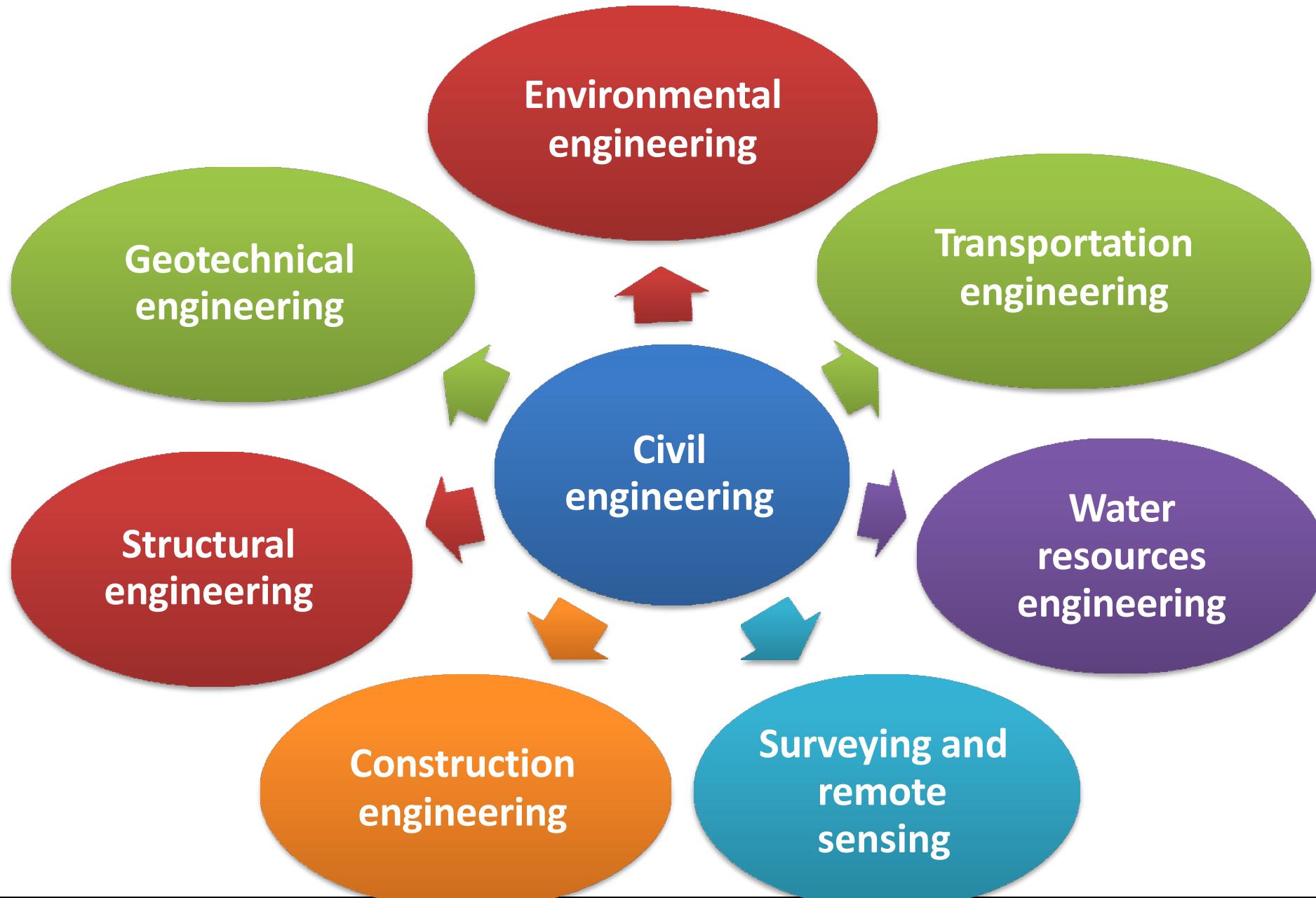
- Investigation
- Surveying
- Planning
- Design
- Execution
- Research and Development

Project Life Cycle (PLC)





DISCIPLINES OF CIVIL ENGINEERING



STRUCTURAL ENGINEERING

- Structure is the assemblage of two or more basic elements such as beam, slab, column, truss, frame, shells etc.
- Analyze and design a structure that will safely bear the estimated loads
- Economy without compromising safety and serviceability
- Repair, rehabilitation and maintenance



GEOTECHNICAL ENGINEERING

- Soil investigation – Properties, bearing capacity
- Ground improvement techniques
- Involves design of
 - Foundations
 - Slopes
 - Retaining Structures
 - Highway pavement design
 - Embankments and earth dams
 - Tunnels, underground structures and deep cuts





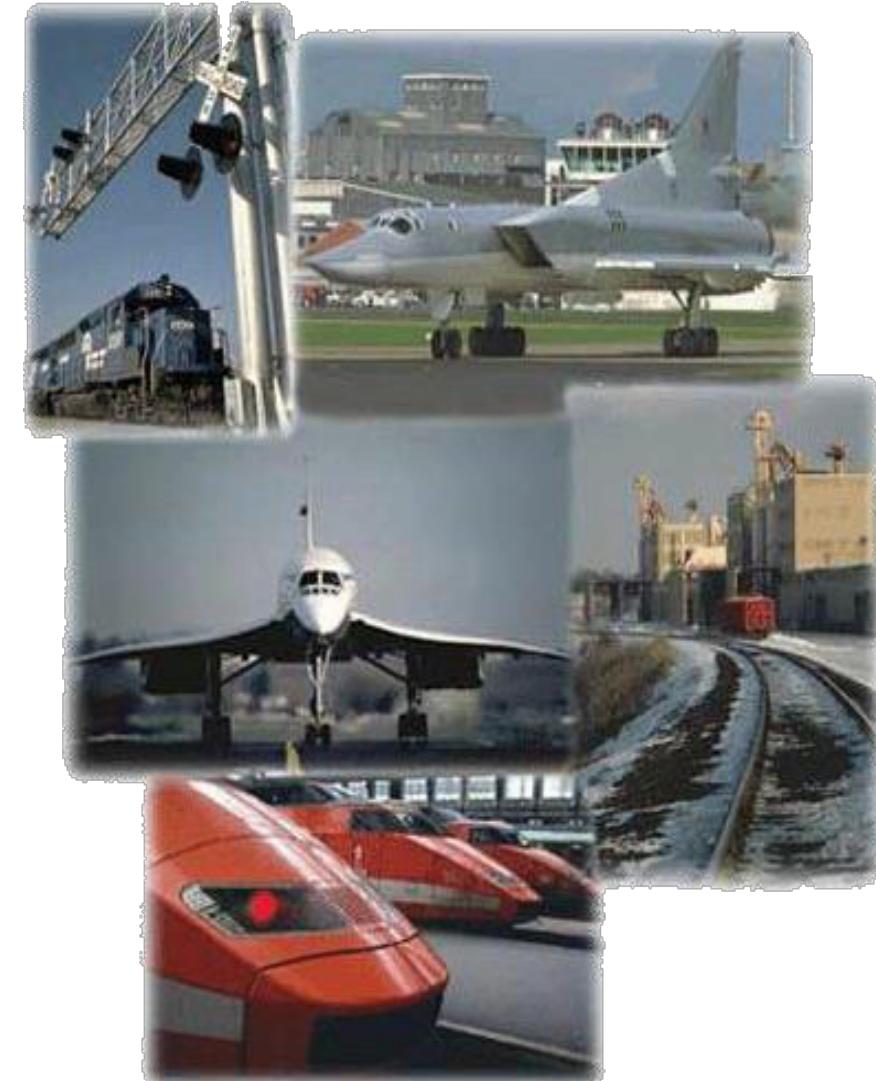
- Work towards achieving a healthy environment
- To provide healthy water, air and land for human habitation and for other organisms, and to clean up the pollution sites.
- Waste treatment and disposal systems

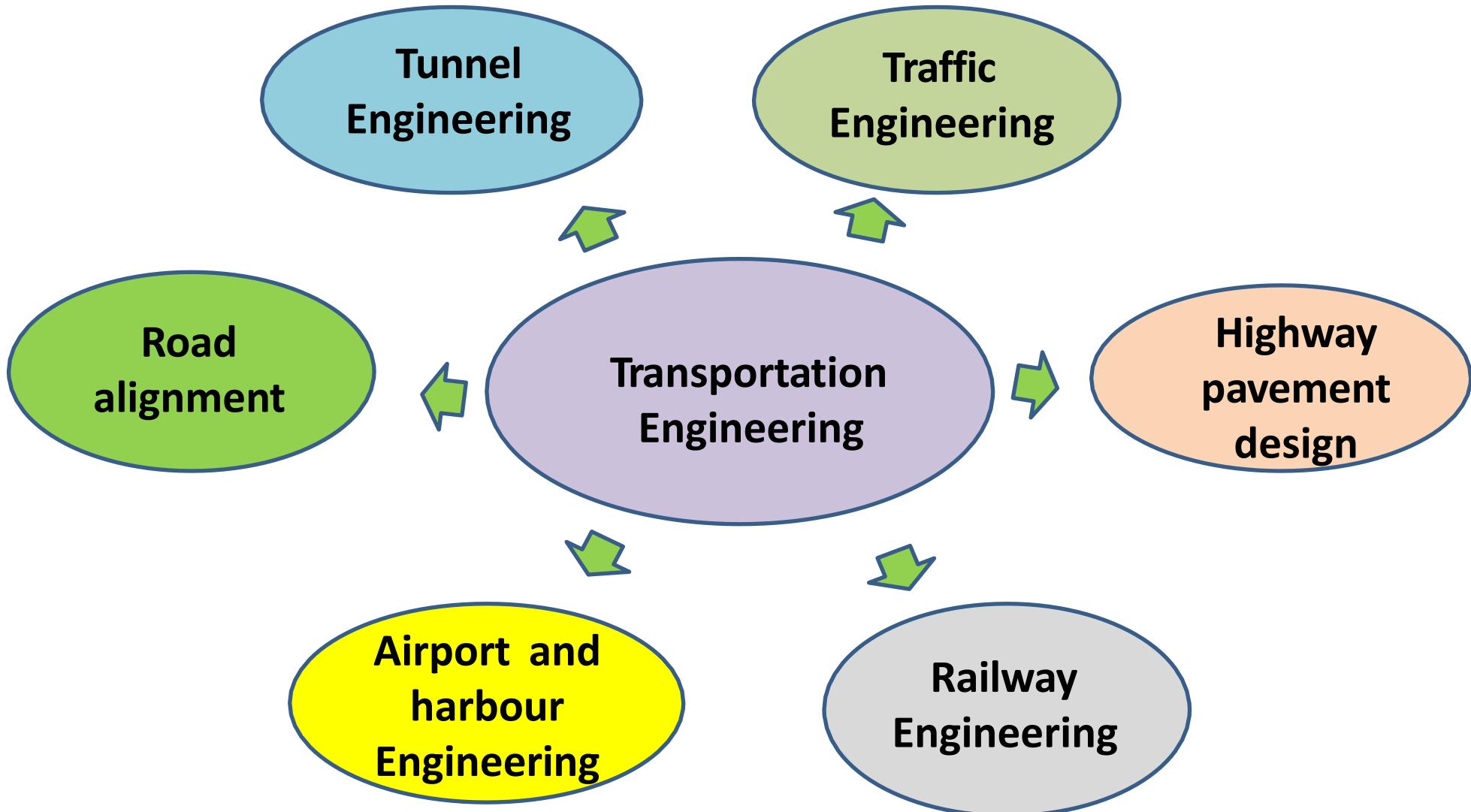


- Water supply and Waste water Treatment
- Waste water treatment
- Environmental laws
- Eco system regulation
- Ground water pollution
- Environmental Impact Assessment
- Water quality monitoring
- Air quality monitoring
- Solid waste management

TRANSPORTATION ENGINEERING

- Application of scientific approach (planning, design, operation and management) to transportation systems such as roads, railway, sea/river & air transports.
- It involves planning, design, construction/operation and maintenance of transportation facility.







SURVEYING

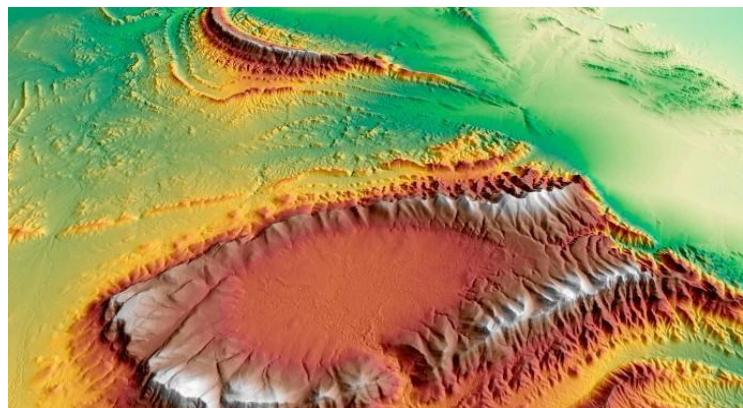
- Surveying is to determine the positions of points on, above or below the surface of the earth by means of direct or indirect measurements of distances, elevations and directions.
- Activity involved in collection of topographic features of a location for future construction.
- Surveying has advanced from chain surveying to remote sensing with the advent of various electronic sophisticated instruments.

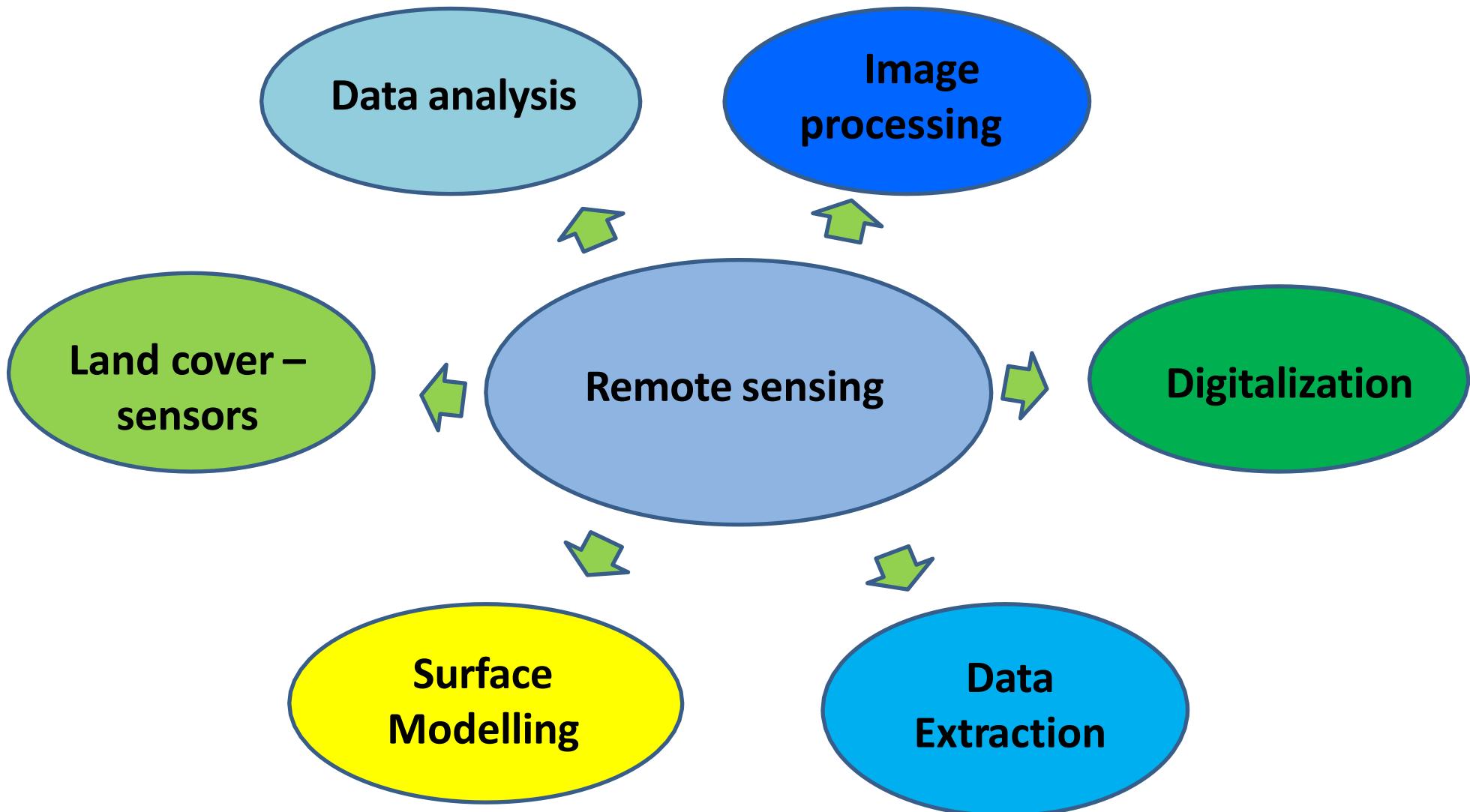


Remote Sensing & GIS

Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites.

A geographical information system (**GIS**) is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.





- Supplying water by man made methods for the purpose of land cultivation with the application of fluid mechanics
- Study and design of works related to the control of river water and the drawings of water logged areas.
- Controlling and harnessing of various resources of water by construction of
- Dams
- Reservoirs
- Canals
- Head works
- Distribution channels

CONSTRUCTION ENGINEERING

- Planning, scheduling and execution of construction activity
- Comprises of men, material, time and money management.
- Emphasis will be on new construction practice
- Use of appropriate and local technology
- Safety of men and material
- Utilization of marginal materials etc.



CONSTRUCTION ENGINEERING

- Project Management
- Construction Management
- Estimation
- Budget
- Cost controlling
- Procurement of materials
- Quality control
- Safety management
- Equipment management

Exercise: 1

Branch	Function
a) Gradient for a sub way	1) Environmental Engineering
b) Safe bearing capacity	2) Structural Engineering
c) Supervision and execution	3) Transportation engineering
d) Water and waste water analysis	4) Geo technical engineering
e) Design of beam and slab	5) Construction Management Engineering



Plan of Building: GROUPING and ARRANGEMENT of components of building in a systematic manner so as to form a homogeneous body with a comprehensive look out to meet its functional purpose.

❖ Well organization of building components

Planning of building depends on:
Human habitation & their requirements Component parts, sizes and inter- relationship
Topography and shape of plot
Climatic condition
Location and neighbourhood





3D view of 3BHK plot



Aspect

Economy

Prospect

Elegance

Privacy

Principles of Planning

Flexibility

Furniture requirement

Sanitation

Roominess

Circulation

Grouping

ASPECT

- **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



PRINCIPLES OF PLANNING

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

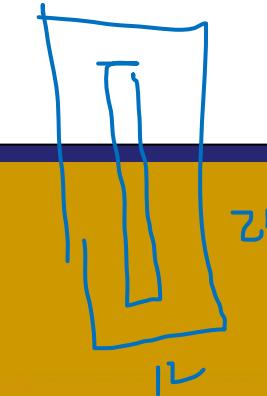
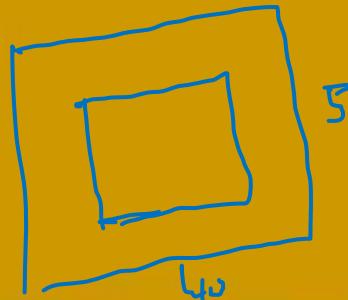


PROSPECT

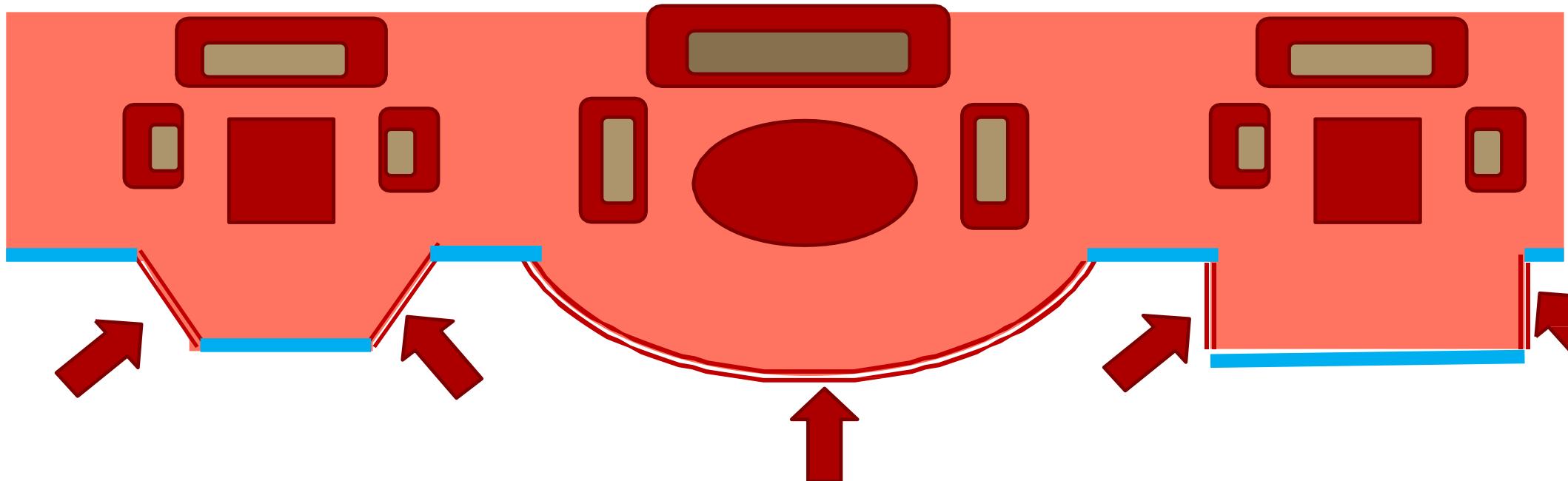
PRINCIPLES OF PLANNING

Prospect

A building is said to have prospect when it presents a good and pleasing appearance when seen from outside. It is used to mean the external view as certain rooms of the building . Exterior wall painting and windows should be provided in an attractive manner. projected windows permit more light and air inside the rooms as shown in fig.

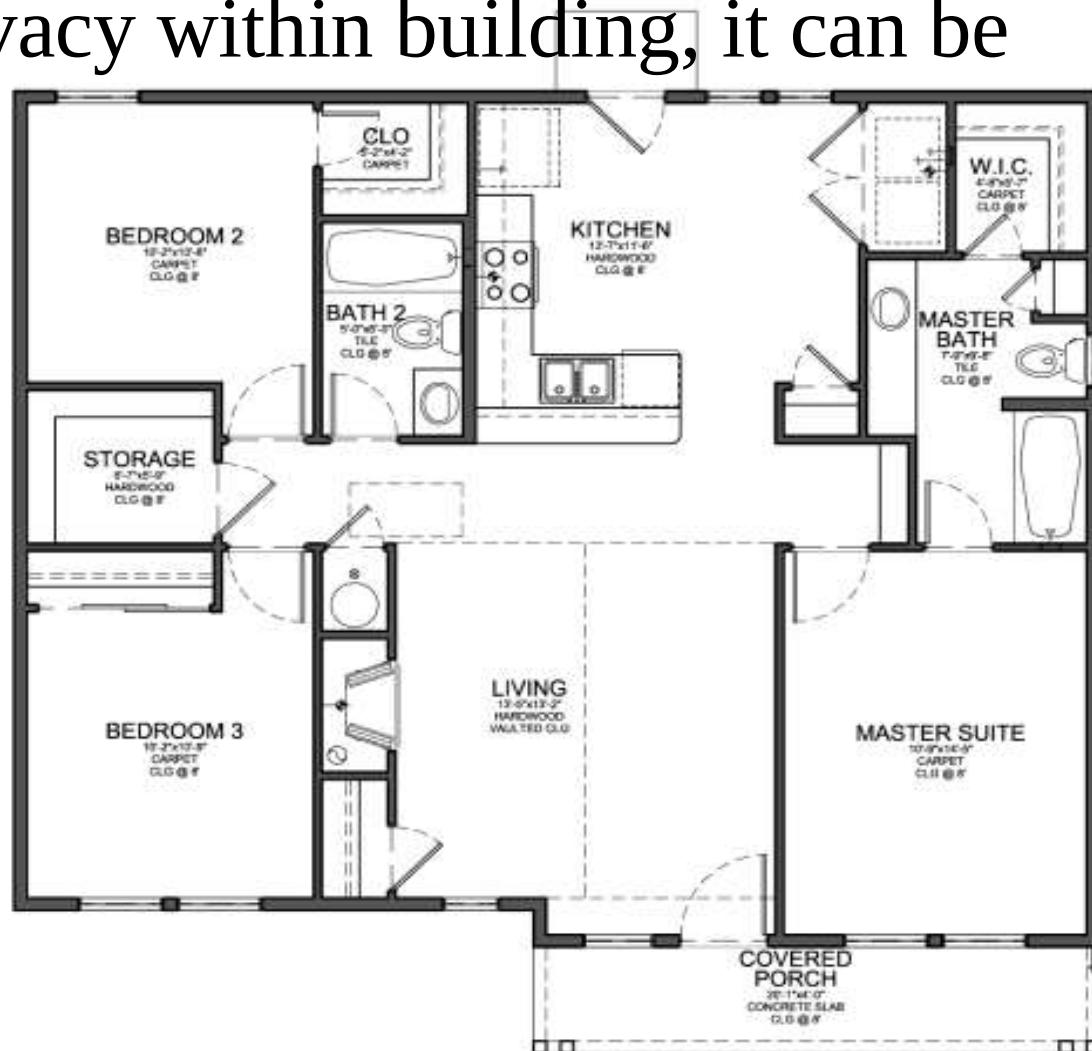


- Arrangement of windows in external walls so as to reveal certain desirable views and conceal undesirable views from outside
- Can be done by putting brackets or by providing blind walls
- Projection of windows gives prospect.



PRINCIPLES OF PLANNING

- **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

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





PRINCIPLES OF PLANNING

- **Furniture requirement :** Planner should know how much space is needed by each function

Room sizes can be completed on basis of

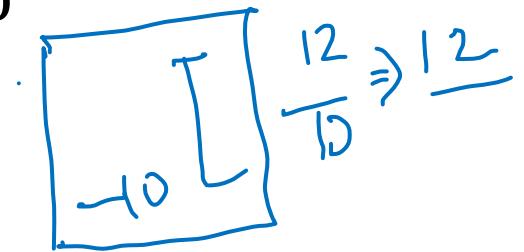
1. permanent furniture to be used
2. It's dimensions and arrangement
3. Clearance for circulation



ROOMINESS

- **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



TOP VIEW OF A RESIDENTIAL



GROUPING

- **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



CIRCULATION

- **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



SANITATION

- **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 = $1/7$ th floor area (hot-humid climate)
 - Min window area = $1/10$ th floor area (dry climate)

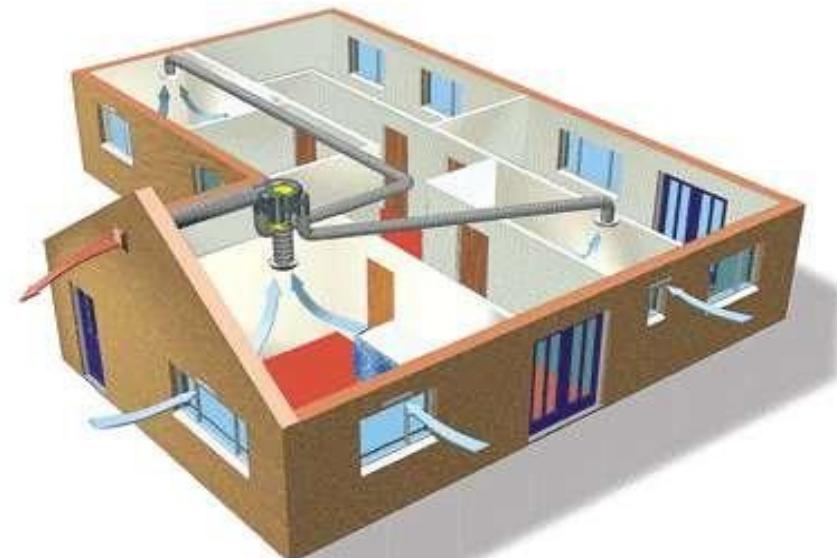
VENTILATION

- **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
- Basic requirements in ventilation
 - Sensation of comfort
 - Reduction in humidity
 - Removal of heat
 - Proper supply of oxygen
 - Reduction of dust
- Orientation of building and location of windows help in providing proper ventilation



TYPES OF VENTILATION

- 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 m^3 , it is achieved by exhaust system of
 - supply system.



CLEANLINESS

Cleanliness

Dust:

1. Creates health problems
2. Makes surfaces dull
3. Floors shall be smooth, impervious, non-absorbing, uniformly sloping



Dampness (wetness):

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



FLEXIBILITY

- **Flexibility:** A room which is planned for one function be used for other, if so required.
 - It is ease with which a room designated for a particular activity can accommodate more load temporarily or may supplement activity of another room
 - As drawing room used as guest bed room
 - Kitchen as additional dining room etc.



ELEGANCE

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
- Nativity
- Adjoining building and relative placement



- 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 corner windows etc.

PRINCIPLES OF PLANNING

- **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
 - Providing small portion for balconies, lobbies
 - Reducing storey height
 - Reducing no of steps of stairs
 - Standardization of sizes of various components and materials





SITE SELECTION



Site should preferably be situated on an elevated and levelled ground.

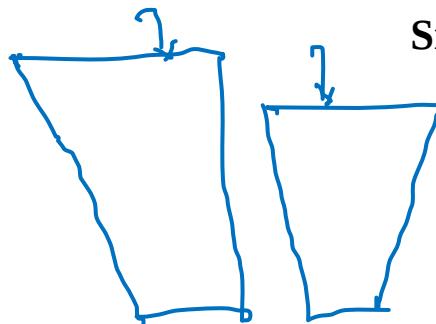
It should not be located in a flood prone area.

The soil at site should have good value of bearing capacity.

The site should not be irregular in shape.

The site should be rectangular or square in shape.

The site should be located in developed area.





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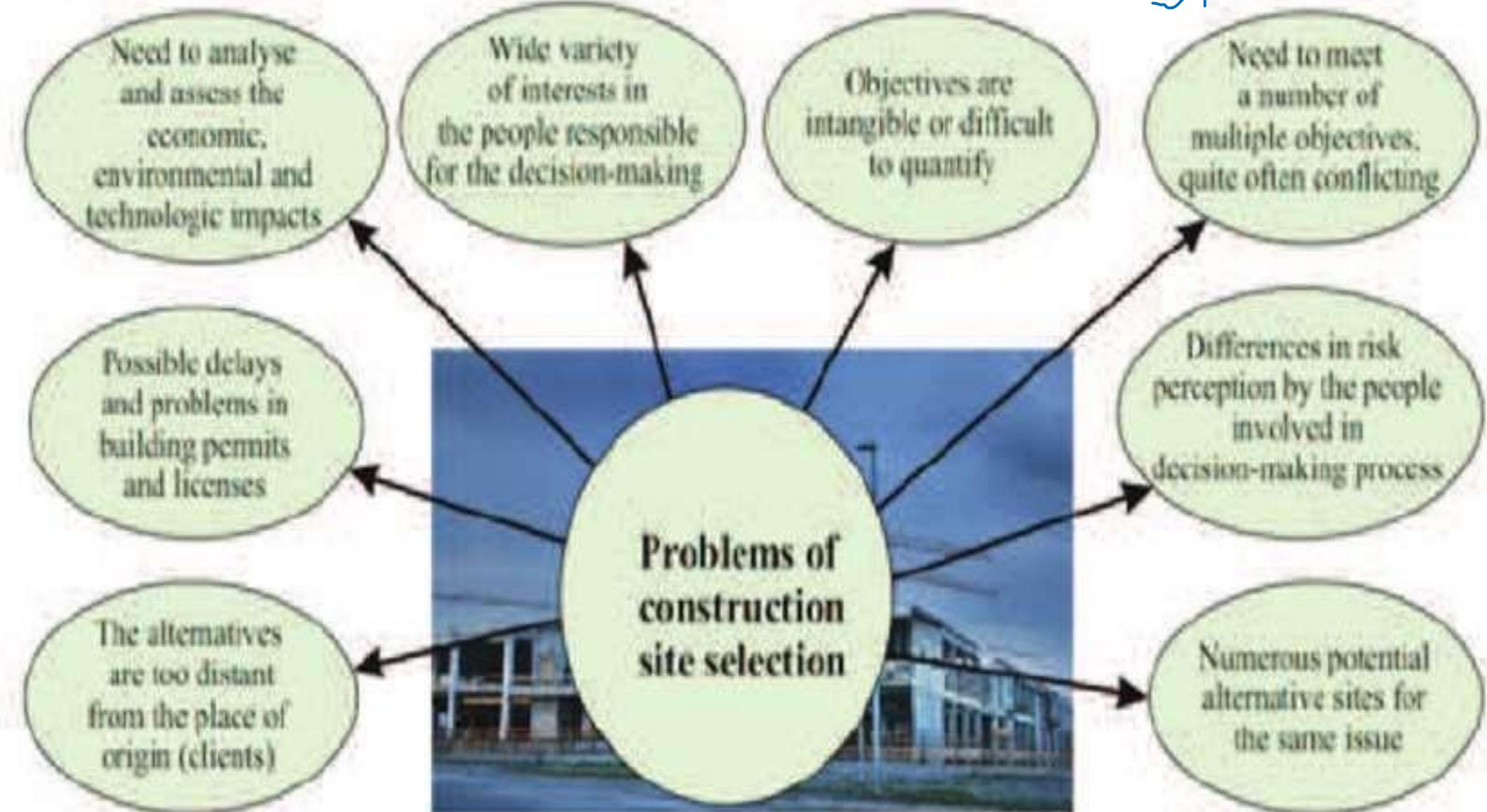
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The site should be located away from quarries, kiln, industrial plants etc.

The site should have unobstructed natural light and air.



Progress Through Quality Education



What is building bye laws?

- The rules and regulation framed by town planning authorities covering the requirements of building, ensuring safety of the public through open spaces, minimum size of rooms and height and area limitation, are known as building bye-laws.
- Rules and regulations which largely regulate the building activity should be formulated to get disciplined growth of building and the better planned development of towns and cities.

Objective of building bye-laws

- pre-planning of building activity
- allow orderly growth and prevent haphazard development.
- Provisions of by-laws usually afford safety against fire, noise, health hazard and structure failure.
- Provide proper utilization of space to achieve maximum efficiency in planning.
- They provide health, safety and comfort to the people who live in building.
- Due to these bye-laws, each building will have proper approaches, light, air and ventilation.

Scope of building bye-laws

- Aspects of different type of building in building bye-laws:
 1. Building frontage line
 2. Minimum plot size
 3. Built up area of building
 4. Height of building
 5. Provision of safety, water supply, drainage, proper light and ventilation
 6. Requirement for off street parking space
 7. Size of structural element

Applicability of building bye-laws

- New construction
- Additional and alterations to a building
- Changing of occupancy of building (residential □ education etc.)
- Development of land is undertaken
- In demolition



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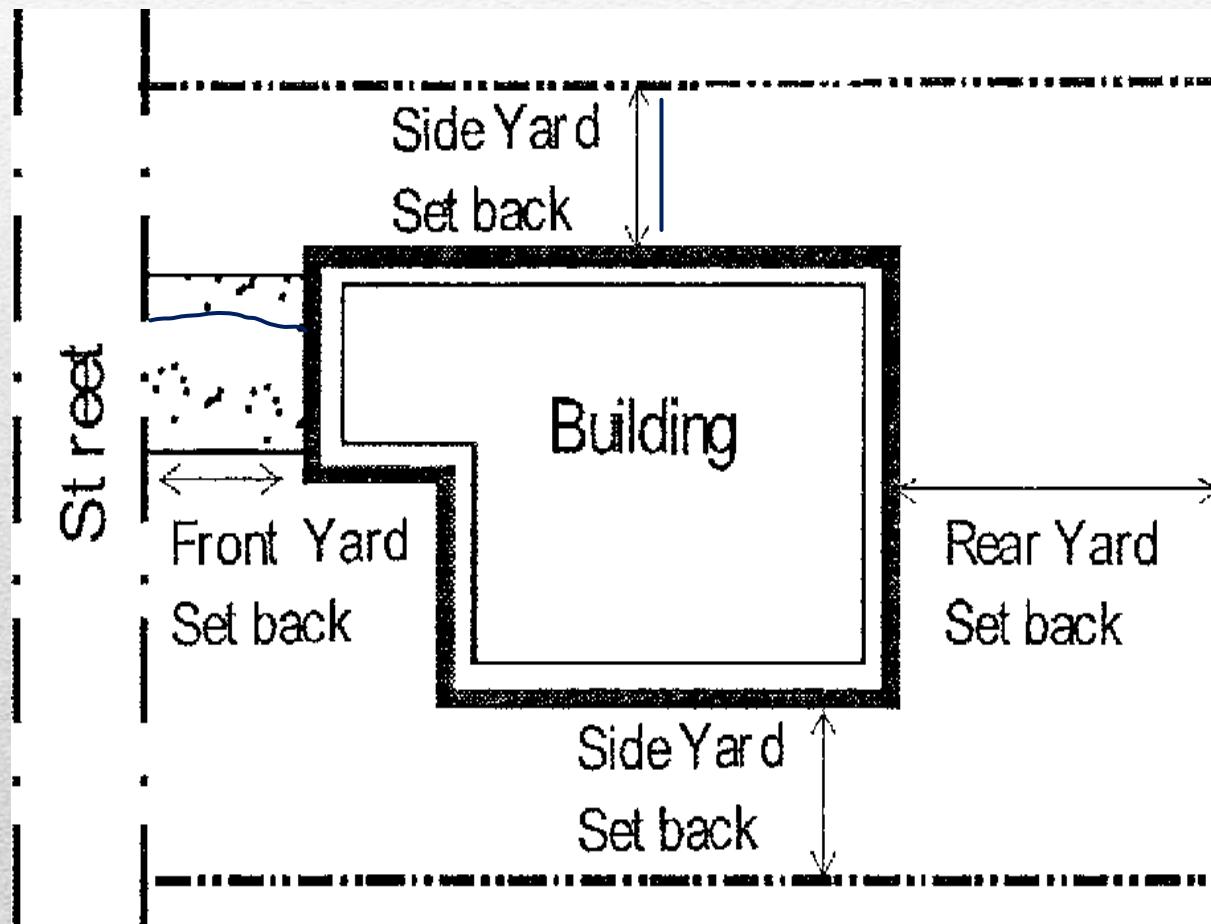
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Set back distance



Permissible Set Back Distance

<u>Width of road</u>	<u>Permissible set back</u>
Up to 12 m	1.5
>12 m	2.0
Road width <3 m and length < 30 m	No set- back

Advantage of set-back

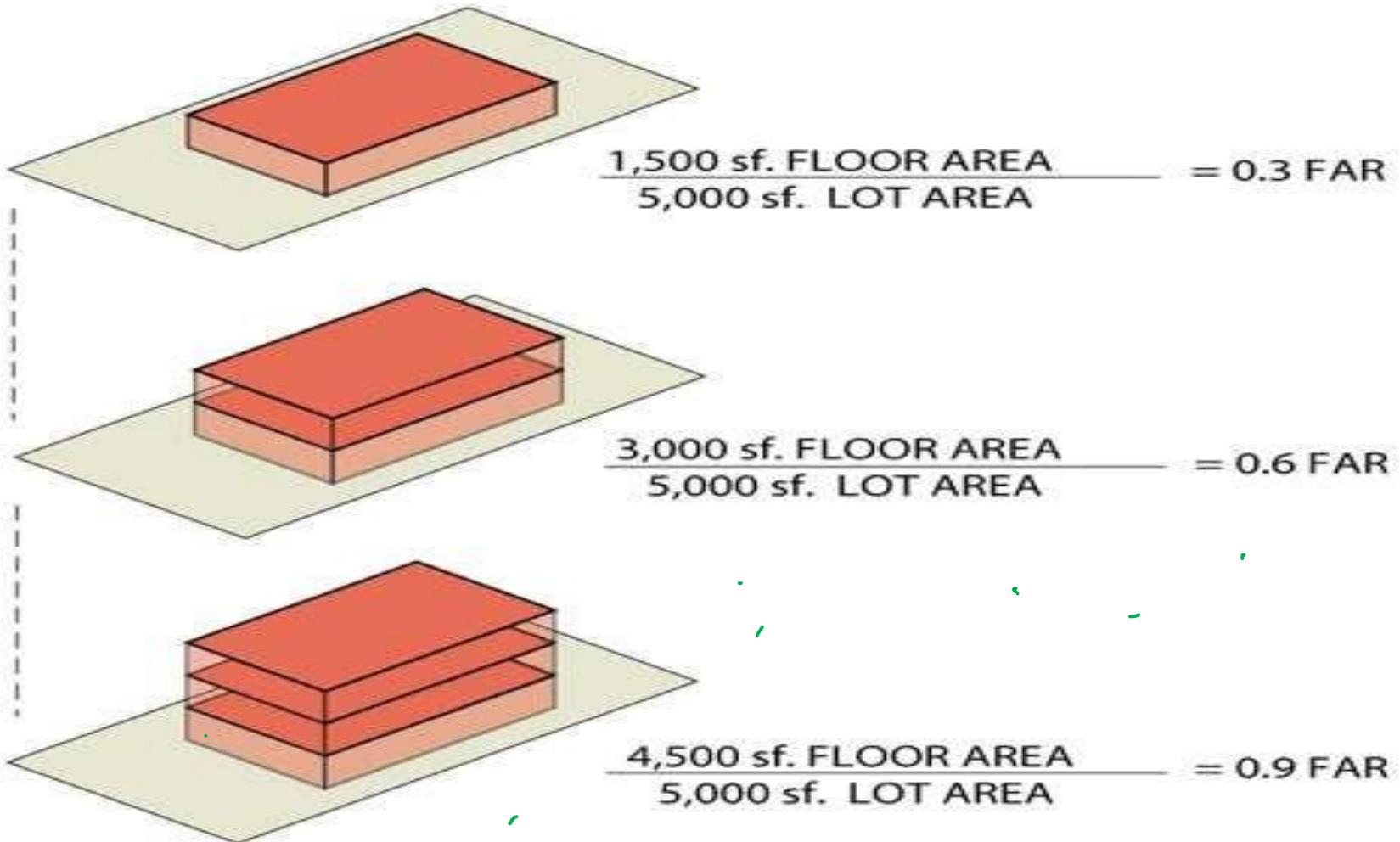
- Better condition of air, light and ventilation.
- At corners it improve visibility and safety from traffic.
- Space for parking.
- Protection of building from street nuisance like noise.
- Reduce the danger of fire from neighbor house.
- It provide privacy in building.

Floor space index

$$FSI = \frac{\text{Total covered area of all floors}}{\text{plot area}}$$

Zone	Permissible FSI	Remark
Residential(scheme area)	1	Max at G.F 0.4
Residential(city area)	4	Width of road more than 12m
Residential(city area)	3	Width of road less than 12m
Industrial (scheme area)	1.5	Maximum allowed on G.F 1.0
Commercial (scheme area)	1.33	Maximum allowed on G.F 0.4

How to calculate FSI



- Classifying the building with unit as a family and mentioning the requirement.
- Classify rooms according to use and then specifying minimum standard of each room with respect to size, height, floor area, ventilation and light.
- Specify height of compound wall and location of gate in wall.
- Controlling projection in marginal space.
- Insisting on suitable FSI or FAR.
- Specify suitable arrangements with respect to drainage and water supply.
- Specify set-backs, light plan and margin.
- Specify minimum size of plots, their dimension and figure.

Building Bye-laws For Residential

- Size of plots
- Area limitation
- Margin
- Height of the building
- Plinth height
- Minimum area of rooms
- Basement
- Compound wall
- Projection margin
- Parapet wall
- Mezzanine floor
- staircase

- Built up area:

The FSI shall be 1.0 with maximum utilization up to 0.4 on ground floor.

Sr.No.	Area of plot	Maximum permissible covered area
1.	<200 m ²	66.67% of the plot area on ground floor and first floor. Nothing on second floor exceeding 25 % of the ground floor.
2.	201-500 m ²	50 % of the plot area or 133 m ² which ever is more.
3.	501-1000 m ²	40 % of the plot area or 250 m ² which ever is more.
4.	>1000 m ²	33.33 % of the plot area or 400 m ² which ever is more.

Height of The Building

- Height of building according to width of street:
 1. The maximum height of the building shall not exceed 1.5 times the width of road.
 2. For building in vicinity of aerodromes, the maximum height of the building is fixed in consultation with civil aviation authorities.
- The height shall not included if building is erected one-third of roof area, including:
 1. Roof tank and its support
 2. Ventilating, lift room
 3. Roof structure other than pent-house

Plinth height

- The height of the plinth shall not be less than 450 mm ground level.
- Minimum height of 600 mm is the best from drainage or other consideration.
- It is minimum 900 mm in water logged soils.

Minimum Size Of Diff. Rooms

No.	Name of room	Minimum area	Minimum size of side	Height	Other requirement
1.	Habitable room -bed room -living room -study room	9.5 m ²	2.4 m	Not less than 2.75 m from surface of floor to lowest point of ceiling	As per need
2.	Kitchen	5 m ²	1.8 m	Not less than 2.75 m	As per need
3.	Bath rooms and water closets	1.8 m ²	If bath and water closet are combined, its floor area shall not less than 2.8 m ² with minimum width 1.2 m	Not less than 2.1 m	As per need



No.	Name of room	Minimum area	Minimum size of side	Height	Other requirement
4.	Store room	3 m ²	-----	Not less than 2.2 m	-----
5.	Garage	12.5 m ²	3m x 6m	Not less than 2.4 m	-----
6.	Stair case		The minimum width of stair is 0.9 m.	Clear head room shall be 2.2 m	<ul style="list-style-type: none">• Minimum width of tread without nosing 250 mm in residential.• The maximum height of rise shall be 190 mm for residential building.

Basement

- The basement shall not be used for residential purpose.
- The basement to be constructed within the prescribed set back and building lines and subject to maximum on entrance floor may be put to only the following use:
 - Storage of household
 - Strongrooms, bank cellars
 - Parking places
 - Air conditioning equipment and other machine

Requirement of basement

- The height of basement from the floor to the underside of the roofslab or ceiling shall not be less than 2.4 m.
- The maximum height of the ceiling of any basement shall be 0.9 m and maximum 1.2 m above the average surrounding ground level.
- Adequate arrangement shall be made such that surface drainage does not enter the basement.
- The walls and floor of the basement shall be watertight.
- The access to the basement shall be separate from the main and alternative staircase providing access and exit from higher floor.

Compound Wall

- Except with the special permission of the maximum height of compound wall shall be 1.5 m above center line of front street.
- It is permitted 2.4 m when the top of 0.9 m is open type construction
- In corner plot it is restricted to 0.75 m for a length of 10 m on side and front intersection.
- The balance height of 0.75 m may be made up through railing and of design to be approved by the authority.



Mezzanine Floor

- Minimum height of mezzanine floor shall be 2.2 m.
- The minimum size of the mezzanine floor, if it is to be used as a living room shall not less than 9.5 m²
- The aggregate area of such mezzanine floor in a building shall in no case exceed 1/3 the plinth area of the building.



FAR/FSI

1. The ground floor area of an residential building is 1400.00sq,ft , which is located in a plot of size 2400.00sq.ft. The FAR limit of that residential zone is 1.0. Now, it was decided to construct an annexure in first floor. What would be the exact area to be constructed in first floor to approval from municipal corporation?
2. The carpet area of a residential building is 900.00sq.ft. Based on the measurement it was found that area of the walls, is 14% of the carpet area. Estimate the total plinth area of the building.
3. The inner dimensions of the class room is 9.00 x 7.00 m . The class room is have a wall thickness of 0.23cm on all the four sides. Find the plinth area of the class room.

Thanks for the participation