**PART (A)**

**BUILDING PLANNING AND DRAWING**

**Terms used in building drawing as per NBC:**

1. **Pictorial Drawing:** A view of an object (actual or imagined) as it would be seen by an observer who looks at the object either in a chosen direction or from a selected point of view. Pictorial sketches often are more readily made and more clearly understood than are front, top and side views of an object. These are either sketched freehand or made with drawing instruments, are frequently used by engineers and architects to convey ideas to their assistants and clients easily.
2. **Isometric Drawing:** In an isometric drawing, the object is rotated and drawn such that all sides visible have equal distortion.
3. **Oblique Drawing:** In an obliquedrawing, the object is drawn to show a non – distorted front view. This drawing is useful for making an assembly of an object and give a production drawing of the object for the manufacturing purpose.
4. **Perspective Drawing:** A perspective drawing shows an object’s natural view. A perspective drawing shows how the object will look like when finished but cannot be used to construct the object because there is no scope to measure the extent of distortion.
5. **Multi – view or orthographic drawing:** These drawings represent the exact form and size of each side an object in two or more views usually at right angles to each other. The orthographic drawings such as plan, elevation and section of a proposed building are provided with necessary details for the estimation and construction of civil engineering projects.
6. **Structural Drawing:** Structural drawings show the structural details (size, shape, material and other specifications) of a member or assembly of members as in case of truss.They can be plan views, or elevation views. These drawings are very useful in actual construction to site engineer and fabricator, to execute construction works. These drawings are useful to estimate the quantum of materials at various stages of construction of any civil engineering works.
7. **Survey Drawing:** Most construction projects involve earth work for laying out roads, construction of buildings, culverts and development of landscape. In highways construction, cutting and filling operations are performed to produce formation to the desired levels. The levels of proposed site are measured by conducting survey using stereoscopic instruments (for small areas) and aerial photographs (for large site areas). These data are then converted into drawing. These drawings are called contour drawings or topographical drawings.

**Factors affecting the selection of site:**

1. Topography
2. Plain grounds
3. Sloping grounds
4. Site at higher levels
5. Road at higher level
6. Undulating ground
7. Elevated site
8. Low lying areas
9. Nature of subsoil
10. Rocky soil
11. Gravels
12. Hard moorum and sandy soils
13. Clayey soils
14. Hard pan type soils
15. Fibrous soils rich in peat and organic matter
16. Made up or reclaimed soils
17. Position of the ground water table
18. Facilities
19. Neighbourhood
20. Certain things those should not be near the site
21. Vegetation
22. Shape of the site
23. Availability of men and materials
24. Proximity to sea- shore, river or lake or a place of natural beauty.

**Functional requirements of a residential building:**

A residential building is a one which is used wholly or partially for human habitation. Residence is divided into three major areas of planning purposes:

1. **Living Area:** Living area of the house is that area where the family meets their friends, relaxes and entertains. Thus the functional requirements of living area is to entertain the guests and to accommodate them suitably. It includes:
2. Drawing Room
3. Dining Room
4. Office Room
5. Guest Room
6. Recreation Room
7. Entrance Foyer
8. **Sleeping Area:** The basic function of sleeping area is to provide facilities for maximum comfort and relaxation. One third of our time is generally spent in sleeping. Bedroom is the area identified for this purpose. The size, shape and number depends on the class of the family and number of persons in the family.
9. Size
10. Location
11. Planning
12. **Bathroom and water-closet:** Generally one bathroom for each bedroom is considered to be most effective but in Indian condition generally there is a central bathroom designed to cater the needs of the entire family. The bathroom and water-closet should either be combined or separated by a partition wall.
13. **Service Area:** Service area includes kitchen, storage centre and garage. Provision for workshop and laundry is made in case of buildings like hotels, hostels etc.,
14. Kitchen
15. Storage
16. Garage

**Minimum size requirements as per NBC:**

**Living Area:**

1. **Drawing Room:** Size of drawing room depends on class and size of the family and also on the provision of furniture to be made. But in no case it should be less than 9.5 m2 (without dining facility) or 14 m2 (with dining facility).

Doors in drawing room should be so located that they do not interfere the circulation of space. The windows should provide sufficient light and properly ventilated.

Opening area of about 20% of floor area is sufficient for proper ventilation and light. In no case, the size of door should be less than 2.0 m x 1.0 m and that of window 1.2 m x 1.0 m.

1. **Dining Room:** Normal size of dining room is 4.0 m x 3.0 m.
2. **Office Room:** Size of this depends on the class of the family and profession. This room should be located in a quiet part of the house preferably near the front of verandah. The room should be well lighted and well ventilated.
3. **Guest Room:** Size of the room should not be less than 3.6 m x 3.0 m.
4. **Recreation Room:** Recreation- room is provided in very high class family accommodations only. It is a room for play and recreation. The size of the room depends on the activities to be performed therein.
5. **Entrance Foyer:** Entrance foyer is a place providing shelter for the guest waiting outside. Its basic function is to control the flow of traffic into and out of the building.

**Sleeping area:** A minimum sized bedroom should accommodate a single bed, besides a table, a small chair and a dresser. But in any case, it should not be less than 9.5 m2 with a minimum width of 2.4 m.

**Bathroom and water-closet:**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Dimension** | **Minimum Requirement** |
| 1 | Height | 2.2 m |
| 2 | Bathroom area (seperate) | 1.5 X 1.2 m = 1.8m2 |
| 3 | W.C. area (seperate) | 1.1 m2 |
| 4 | Bathroom + WC | 2.8 m2 min. width = 1.2 m |

**Service area:**

1. **Kitchen:**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Dimension** | **Minimum Requirement** |
| 1 | Height | 2.75 m |
| 2 | Area (with no store-room) | 5.5 m2 (minimum width 1.8m) |
| 3 | Area (with store-room) | 4.5 m2 |
| 4 | Kitchen cum dining | 9.5 m2 min. width = 2.4 m |

1. **Store Room:** when kitchen cum storage is provided, the area generally provided is about 15-20 m2.
2. **Garage:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Vehicle** | **Minimum Area** | **Minimum Height** |
| 1 | Scooter | 1 m x 1.5 m | 2.2 m |
| 2 | Car | 3 m x 6 M | 2.2 m |
| 3 | Tractor | 3 m x 5 M | 2.8 m |

**Standard Sizes of windows:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Location** | **Sill Height** | **Masonry Opening Size** |
| **(in mm)** | **(in mm)** |
| W1 | Habitable Room | 750 | 1800 x 1350 |
| W2 | Habitable Room | 900 | 1800 x 1200 |
| W3 | Habitable Room | 750 | 1500 x 1350 |
| W4 | Habitable Room | 900 | 1500 x 1200 |
| W5 | Habitable Room | 750 | 1200 x 1350 |
| W6 | Habitable Room | 900 | 1200 x 1200 |
| W7 | Habitable Room | 750 | 900 x 1350 |
| W8 | Habitable Room | 900 | 900 x 1200 |
| W9 | Habitable Room | 750 | 600 x 1350 |
| W10 | Habitable Room | 900 | 600 x 1200 |
| W11 | Habitable Room | 750 | 450 x 1350 |
| W12 | Habitable Room | 900 | 450 x 1200 |
| W13 | Kitchen | 1050 | 900 x 1050 |
| W14 | Toilet | 1050 | 600 x 1050 |
| W15 | Toilet | 1050 | 450 x 1050 |

**Standard Sizes of Doors:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Location** | **Shutter Size** | **Masonry Opening Size** |
| **(in mm)** | **(in mm)** |
| D1 | Entrance | 1100 x 2045 | 1200 x 2100 |
| D2 | Entrance | 1000 x 2045 | 1100 x 2100 |
| D3 | Internal (for rooms) | 900 x 2045 | 1000 x 2100 |
| D4 | Internal (for rooms) | 800 x 2045 | 900 x 2100 |
| D5 | Kitchen & Store | 800 x 2045 | 900 x 2100 |
| D6 | Toilet / Bath | 800 x 2045 | 900 x 2100 |
| D7 | Toilet / Bath | 650 x 2045 | 750 x 2100 |

**Standard Sizes of ventilators:**

|  |  |  |
| --- | --- | --- |
| **Height of Building in m.** | **Size of ventilation shaft in sq m.** | **Minimum size of shaft in m.** |
| 9.0 | 1.5 | 1.0 |
| 12.5 | 3.0 | 1.2 |
| 15 and above | 4.0 | 1.5 |

**UNIT II**

**Principles of planning of a residential building:**

* A residential building is one which is used wholly or partly for a considerable time or permanently for human habitation.
* A house is one which gives shelter to its inmates against the weathering elements as the sun, rain, wind and snow.
* A home denotes more than the house, providing the shelter against weathering elements. It is the nerve centre for social life not only for providing happiness, convenience, comfort for family members of all ages in all conditions but also share their emotions and attachments, a place where bodies and minds of young children are nurtured so as to fit them for shouldering their responsibility and contributing to the family heritage.
* House, bungalow, block of flats and even cottage fall in the category of residential buildings. It includes hotel, hostel buildings, dormitories and motels which are used for residential purposes for short duration.

**Prior to planning of a residential building, it is essential for the planner to consider the following:**

* Size, shape and location of the plot
* Specific requirement of the occupants
* Fund resources available
* Locally available materials for construction
* Meteorological conditions of the area.

The dwelling should be planned on the basis of a family as a unit. However, the number of family members, their ages and relationships, vary largely and thus, requirements in accommodation vary from family to family and from one income group to another income group.

Hence, no hard and fast rules for a particular standard of accommodation can be laid down. However, the units which are a must for a residential building are the bedroom, kitchen, dining space, w.c. and bath and a stair. In addition to these, a number of other units as pantry, drawing room, study room, library room, recreation room, guest room, dressing room, Store room, parlour (sitting room), veranda, prayer room etc. may be provided.

**PRINCIPLES OF PLANNING OF BUILDING:**

Plan of a building is the assembling or grouping and arranging of its component parts in a systematic manner and proper order so as to form a meaningful i wholesome and homogeneous body with a comprehensive look out to meet its functional purpose.

**Planning of the building depends on:**

* Its functional object and requirements
* Its component parts, their sizes and the relationship between the different rooms
* Shape of the plot –
	+ - * Regular or Irregular
			* If regular square (length to breadth ratio less than 1.2) or oblong
			* Topography - Levelled
			* Plain
			* Steep sloping
			* Split level

Climatic conditions of the place

* Open as with extended arms of L,E, I, Tor H
* Closed and compact

Its location and neighbourhood

* Whether single storeyed or multi-storeyed
* Detached, semi-detached or row houses

Besides a number of other factors like

(1) Rental value

(2) Bye-laws.

**FACTORS OR PRINCIPLES FOR PLANNING OF BUILDINGS:**

The factors or principles which govern the theory of planning are explained in detail as shown below:

* Aspect
* Prospect
* Privacy
* Furniture requirement
* Drawing room
* Dining table and dining chairs
* Bed room
* Kitchen
* Roominess
* Grouping
* Circulation
* Sanitation
* Flexibility
* Elegance
* economy

**Aspect:**

The arrangement of door and windows in external walls of a building will allow the occupants to receive and enjoy nature’s gifts as sunshine, breeze and scenic beauty of landscape. The manner of arrangement of the doors and windows of the external walls of the building to draw maximum advantage from sun and is termed as aspect. A room which receives light and air from a particular direction is said to have aspect of that direction.

* Aspect is a very important consideration in the planning of a building. It influences the appearance of a building.
* A building must be designed to suit the site with all its varying aspects. Aspect not only provides comfort, but is a requisite from the hygienic point of view as well,
* Each room of a residential building should have a particular aspect because certain rooms need morning sun and other rooms need less light.

**Prospect:**

* It is to enrich the outside view i.e., elevation or end-view created by prominently exposing the better constructed and better looking portions and at the same time concealing from the view any undesirable ones.
* Prospect must not only make outer appearance attractive, but also maintain qualities such as comfort, cheerfulness, security, labour-saving and up-to-dateness. It must also prove to be a good investment.
* The outside appearance can be improved by attractive planning, providing; teas windows and utilization of good landscape or seascape.

**Privacy:**

Privacy is the seclusion or isolation of an individual or a couple or a group from the rest of the inmates of the house. It is essential for a bath room, water closet, bed room and an office room. Privacy can be a privacy of sight as needed in bath rooms, water closets or privacy of sound as needed in confidential discussions and in study room, or both privacy of sight and sound as required in a bed room.

**Internal privacy:**

It is privacy achieved within the building and it easy.

* Proper grouping of rooms as bed, dressing and toilet, kitchen and dining.
* Careful planning of entrance and circulation space.
* Better deposition of doors and windows and made of their hangings.
* Vertical segregation of the rooms i.e., by providing Drawing, Dining, Kitchen and Toilet rooms in ground floor and Bed and Toilet rooms in the first floor.

**External privacy:**

Privacy of the whole building with reference to the surrounding buildings and roads.

External privacy can be achieved by:

* Having a compound wail to a height of 1.35 m to 1.5 m above the adjacent road level.
* Construction of porch or portico at the main entrance.
* Planting trees along the compound walls which acts as sound barriers and sight barriers as well.
* Providing ground glass windows and ventilators. Venetians have the advantage
of offering privacy as well as air circulation. Ground glass venetians offer light as well as privacy.
* Providing screen walls, curtain walls and dwarf wall on veranda.
* Planting creepers along the boundary Fencing or growing shrubs.

**Furniture requirement:**

One of the most important requirements of a building planner is to know how much space is needed for each function in a particular building. The room sizes for a particular function can be computed on the basis of permanent furniture of standard dimensions to be in that room. How much space is required for performing a particular activity is known through anthropometric studies. Dimensions of furniture to be used in that room is also known. Hence, arranging furniture in that particular room keeping clearance for circulation, dimensions of the room can be finalized. Hence, while planning a building, furniture arrangement must be shown to justify the size of a room. Room areas are not only related to furniture sizes, but also to their arrangement. A different layout if arranged in the same space may not be equally efficient. Hence, planning of a room depends on the number of users and its furniture and alignment of furniture.

**Drawing room:**

* A drawing room usually occupies 25%or more of the plinth area of a residential building
* TV must be placed at a minimum distance of' 2.5 m from the viewer. Again good light. The horizontal angle of vision should not exceed 30degreesfrom the centreline of TV for clear view.
* A minimum clearance of 450 mm is required between neighbouring chairs.
* A minimum clearance of 1800 mm is required between two rows of chairs facing each other.

**Dining table and dining chairs:**

**Dining table:**

* The standard height of the dining table is 750mmabove the floor level.

**Dining chairs:**

* The seats as well as the back rests are rectangular or trapezoidal in shape of a minimum width of 450 mm and of the same depth. The seat is provided at 450 mm above the floor level. The overall height of the chair is around 900 mm.

**Bed room:**

* The bed is supposed to be at a level of 450 mm above floor level.
* A dressing table of 500 mm x 1000 mm holding a tall mirror at a 450 mm above floor level is usually provided.

Scanned by CamScanner

* A sitting stool of 450 mm dia. and of the same height is also to be provided.

**Kitchen:**

* Working triangle
* Kitchen platform

**Working triangle**:

* It is the relative location of Place of cooking (STOVE),
* Place of washing (SINK),
* Place of storage (FRIDGE).

The three should be well separated (distance between any two not less than 1 metre but mutually accessible (the imaginary perimeter of the triangle connecting them should not be greater than 7.5 m).

**Kitchen platform**:

* It is 600 mm wide platform provided at a height of 800 mm above floor level along with stove and sink with drain board.
* Cupboards provided below are to harbor heavy kitchenware. Overhead cabinet is to contain lighter kitchenware and smaller containers of spices, groundnut, cashew-nuts etc. to a maximum height of 2 m above floor level.

**Roominess:**

* It Is the general feeling created after a room is well-furnished with all the permanent furniture as a spacious and well-planned.
* The room should be such that it can be put the maximum use but having minimum possible dimensions, Cheap to construct and easy to clean.
* Some rooms may create the impression of being crammed with furniture. Whereas some others may create a tunnel-like feeling as we enter.
* A square room has no advantage and a rectangular room of the same floor area gives a better outlook. A simple illustration can be given of comparing square room with a rectangular room.

**Grouping:**

Grouping is the planning of two or more related rooms in proximity of each other. It minimises the length of circulation and at the same time improves the comfort, privacy and convenience of the inmates of the house. Grouping varies according to the type of a building. All public buildings should be designed taking into consideration the movement of persons from one unit to another without causing disturbance to the other units.

* The shape of a building depends upon grouping of various individual units. The following points are to be considered while planning residential buildings:
* Veranda adjacent to the drawing room has its own advantage. When the visitors are more in number they can be accommodated on the veranda. The furniture from the drawing room should be disturbed through the minimum length. Strangers can be received on the veranda itself.
* The dining room close to the kitchen permits an easy serving of dishes in the desirable state i.e., hot or cold. Further the odours and smoke of kitchen are kept off from other rooms, bed and drawing rooms in particular.
* The bed room, toilet and dressing room may be grouped together for better privacy.
* The bath room and water closet should be nearer to each other. This saves the length of the water supply pipeline. Besides, these two rooms require water and storage vessels, when the supply is intermittent. They also collect waste water blended with the body wastes whose disposal is to be done in a hygienic manner. They are to be provided with doors of 650 mm to 750 mm in size and of single shutter.
* Kitchen should be nearer to the backyard and the doors and windows are so located that the housewife can have a free unobstructed sight.
* If more than one bedroom is provided. They should have an easy access to the dining-room.
* Staircase should be centrally located and easily accessible from draw in room.
* The water-closet should be away from dining-room.

**Circulation:**

* Circulation is the access into or out of a room. It is the internal movement inside a building and the area earmarked for it. It is the space used for getting comfortable communication from one room to another or from one floor to another.
* The position of doors dictates the area of circulation which in turn controls privacy; comfort and convenience. Circulation inside a house should be simple, systematic and short.
* The sequential operations like the movements from kitchen to dining and bed to toilet control the provisions for circulation.
* Circulation area should be straight, short, bright, lighted both day and night and well ventilated. Circulation should neither affect the privacy of a room nor interfere with the utility space.

Circulation in a building is of two types:

* Horizontal circulation
* Vertical circulation.

When the circulation is within the same floor, it is called horizontal circulation and when it is between different floors it is called vertical circulation.

**Horizontal circulation:**

* Horizontal circulation within a building is facilitated by verandas, corridors, halls and lobbies. Passages should never be narrow, dark, zigzag or winding. They should be free from obstructions.
* Window-shutters should never flung open into the passages particularly when people are passing over. No stationary object is to be placed in area of circulation. Area of the horizontal circulation may constitute about 20% to 25% of the total plan area of a residential building.
* It may be more for public buildings.

**Vertical circulation:**

* It is the movement from one floor to another in a multi storied building.

**Sanitation:**

The factors influence sanitation are:

* Lighting
* Ventilation
* Cleanliness

**Lighting:**

**Day lighting:**

* Sun is the source of light.
* Day light is preferred to artificial illumination.
* Morning sun is pleasant and has vitamin D. It is the best tonic for rickets. Sun rays even if diffused kill pathogenic bacteria and keep the vision clear. Natural light stimulates the blood. This stimulation controls tuberculosis (TB.)

The intensity of illumination depends on

* Latitude - Maximum on equator and reduces with increase in latitude (towards N or S) Solar altitude - increases with solar altitude (00 at sunrise or sunset and 900 at noon)
* Sky factor - Maximum when the sky is clear, least when cloudy
* Season - Very bright in summer and less bright in winter and cloudy- in rainy season Orientation of windows

**Ventilation:**

**Types of ventilation:**

* Natural ventilation
* Mechanical ventilation.

 **Natural ventilation:**

* It is the controlling of the movement of air within a room by providing openings as windows, ventilators and louvers, in the walls.
* A single window (irrespective of its size) in a wall rarely serves the purpose of ventilation unless the door of the room is also kept open.
* **Width of window**: In general more is the window area more is ventilation. But when the total width of windows exceeds 66.67% of the total length of the wall any further increase has little influence on ventilation. Window area should be a minimum of 10% of floor area for any habitable room while 15% to 20% is preferred for Bed and Drawing rooms. A value greater than 25%. Does not increase ventilation much. A minimum sill level of 0.9 in is preferred for privacy as well as effective ventilation. Window top level at more than 2 m may not serve any useful purpose except where the headroom is more than 3.5 m.
* **Number of windows:** A wider window is preferred to 2 or more narrower windows on the same wall. At least two windows on the opposite walls serve effective ventilation and inflows on adjacent walls are the next preference. A small window (ventilator or opening) is provided just below the roof slab of Walls to expel hot air accumulated.
* **Operating forces in natural ventilation**

**Cleanliness:**

* Dust harbours bacteria. Besides rendering the surface dull, it carries health problems. Hence, the floor which receives most of the dust should be smooth, impervious, non-absorbing and uniformly sloping so that it collects less dust and is easily cleaned.
* Dampness is the root cause of infection. Hence, walls and floors should he damp-proof.
* Sanitary conveniences such as bath and water-closet should be so designed that the wastewater drains off as quickly as possible. Their flooring should be smooth, impervious, non-absorbent, non-slippery and given proper slope for the quick drainage.
* Also their walls are to be finished with glazed tiles to a height of one metre above the floor level. The corners are preferably rounded off and this is for the quick drainage and to prevent dust accumulation along sharp corners.
* Similarly wastewater generated in the kitchen must find a way out in hygienic manner.

 **Flexibility:**

* Flexibility is the ease with which a room planned for one function be used for other, if so required
* It is the ease with which a room designated for a particular activity can accommodate more load temporarily or sometimes may have to supplement the activity of another room as the drawing room being used as a bed room for guests, kitchen as an additional dining room etc.
* If the rooms are big enough (more than 15 m2 in area) and have a minimum width of 3 m, then they are more flexible and the activities of various rooms can be easily exchanged.

**Elegance:**

* Elegance is the grand architectural appearance of a building because of grand elevation which in turn depends on very good plan.
* Selection of site for the building greatly affects the elegance. Splendid architecture of a beautiful building located in a depression may go unnoticed, whereas an ordinary building on an elevated spot gives impressive appearance and catch the attention of every one.
* Also elegance depends on architecture, neighbourhood and conformity with nature, nativity, adjoining buildings and their relative placement which governs the contrast.
* A type of architecture which created a sensational feeling at one place may be a miserable failure at another place because of lack of conformity with neighbourhood, environment and natural background.

A better elegance can be obtained by

* Selecting superior building materials for facing such as polished stones of granite, marble or mosaic.
* Glass - either transparent or opaque, coloured or plain.
* Timber - polished teak or sun-glass.
* Paints and varnishes with proper contrast.
* Providing bay Windows, corner windows etc.
* Utility and easy maintenance are to be considered while planning elevation, dusty areas and elements depriving of privacy are to be avoided.

**Economy:**

It will reduce cost of construction and hence will be economical. Economy should not be achieved at the cost of strength; otherwise the useful life of a building gets reduced. Only with proper planning and utility of space being maximized (passage being minimized), it should be achieved. Hence, economy may not be a principle of planning but it is definitely a factor which affects planning.

Economy restricts the liberties of an architect on aesthetic development up to certain extent.

Economy can be achieved by implementing the following measures without affecting the utility and strength of the structure.

* Providing simple elevation.
* Dispensing of porches, lobbies and balconies.
* Reducing the storey height.
* Reducing the number of steps of stairs by giving more rise to the steps.
* By standardization of sizes of various components and materials.

“The present trend of construction is towards simplicity”.

**PLANNING OF A SCHOOL BUILDING:**

The following essential conditions are to be satisfied for the site selection of school:

* The surroundings must be quiet, calm, peaceful, gleeful and cheerful with adequate natural breeze and sunlight.
* It should be away from dust and busy traffic and from ghastly sights •as those of cemeteries and slaughter houses.
* The site should be gently sloping and well drained.
* The site should be easily accessible from existing and newly settled areas in all seasons.
* The site should be at a minimum distance of 300 m from continuous
* Source of sound as a workshop if no obstruction (i.e. sound barrier) exists in between.
* The site should be away from noxious industries.
* The site should never be flood affected nor in the proximity of pond, river or deep ravine or abandoned well.
* The site should be such that no public road or railway line passes through it. No high tension (high voltage electric power) line should pass through the area. The site should not be a made up ground.

 **Principles of planning:**

* Built in area of a school should not exceed 25% of the site area. The remaining 75% of land is to be used for sports fields and gardens.
* It should be single storeyed, double storeyed and rarely three storeyed.
* Minimum plinth height of any building should he 750 mm.

**Components of a school:**

The school building mainly comprises of

* Class rooms
* Laboratories, drawing halls, library, auditorium, gymnasium
* Administrative area, staff rooms
* Play fields, assembly.

**Design of a class room:**

With the rapid advancement in teaching techniques, education in primary schools and secondary schools is being reoriented to meet the ever growing needs of the day. In recent years education policy emphasizes to educate children through activities related to life. A class room should not be a mere enclosure of space but should meet the diverse needs of multifarious activities of the students.

* To arrive at a suitable size and shape of a class room, the following factors should be taken into consideration:
* Basic dimensions of children and their space requirement.
* Arrangement of furniture and equipment.
* No. of students to be accommodated
* Type of activities to be carried out

**Principles of planning a school building:**

 The school building is so planned such that the environment is ideally suited for learning, teaching and working together.

**Aspect:**

* Class rooms should be well ventilated.
* Sufficient day light (without glare) should be available for easy reading and writing.
* The entrance door should open on to the dais (near the black board) but should never face the students or their teacher.

**Roominess:**

* Width to length ratio of a class room should be 1:1.2 to 1:1.5. Rooms of length greater than 2 x width create a tunnel like feeling.

**Furniture:**

* A dual desk of 1000 mm x 500 mm (to accommodate two) is desirable than longer desks.

**Grouping:**

* Office and head master's room are grouped and located near the entrance. Girls' waiting room and toilet are to be grouped.

**Circulation:**

* Horizontal circulation should be as less as possible and circulation: utility should not be more than 1:3. There should be only one entrance into a class room.

**Privacy:**

* Every class should have its privacy by planning not more than 3 class rooms in a row.
* It is still desirable if each class has independent access.
* Never one class room should influence another.

**PLANNING OF HOSPITAL BUILDING:**

**Hospital**: A place where people are treated for various diseases and giving advices for healthy living.

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**Classification of Hospital-buildings:**

* Clinic
* dispensary
* Primary health care centre
* Nursing homes
* General hospital
* Super speciality hospitals

**Dispensary: S**mall health centre, medicines are prescribed.

**Clinic:** Medical examination and some treatment will be given, private doctors having own.

**Primary health centres (PHC):**

* These are also called clinics
* These are run by govt. doctors.
* Population- 800 to 1000.

**Speciality hospitals:**

* Specialised facilities
* District level
* Population – 8000 to 10000.

**Super speciality hospitals:**

* Located at cities
* Advanced treatments.

**Nursing homes:**

* Special treatments
* Patients stayed for short durations.
* Run by private or govt. doctors.

**General hospital**:

* It comprises all the above units.
* More specialised facilities
* Managed by local body or govt.
* Charitable trusts, service organisations etc… gave financial aid, furniture, medicine, equipment etc…

**Factors to be considered planning of hospital building:**

* Site selection
* Planning
* Wards
* Operating theatres
* Radiology department
* Pathology department
* Staff quarters
* Sanitary units

**Site selection:**

* For General hospitals:
* Located centrally in quite place
* Well connected by transport.
* For Infectious diseases hospitals: ( T.B, etc..)
* Away from the city
* Good transport facility
* Healthy atmosphere like hilly stations.

**Planning of Hospital Building:**

Essentially divided into 3 main units

1. Outpatient care
2. In- patient care
3. Emergency

All the 3 are provide with separate entrance

**Other essential units**:

1. Diagnosis and treatment
2. Administration
3. Education and research

**Wards:**

* Spacious halls admitted the patients by the advice of doctors
* These different types depends on the type disease and purpose:
	+ - Maternity
		- Cardiology
		- Paediatric
		- Surgical
		- Emergency etc….

**Measures to be kept in mind while planning of wards:**

* Area of ward per bed- 8 -10 m2 (no. of beds per ward 24-30)
* Max. distance from bed to water closet -12m
* Working room of nurse to farthest bed 20m
* 50% of beds visible to nurses
* Noise level not more than 40db to 45 db during & 35 to 40db night
* 20% floor for windows for good ventilation
* Circulation area 25 to 40%
* Nurses and dispensing room area 10 to 12 m2

**Operating theatres:**

* Size and equipment of O.T varies according to the requirements of each hospital
* Area required is 20 to 30 m2
* Corridor is needed (single or double). Width is 3m to 4m & other is 1.5m
* Sterilization - 8 to 10 m2
* Anaesthetic room - 8 to 10 m2
* Doctors room – 10 to 12 m2

**Radiology department:**

* X-ray equipment require ceiling height of 3.1 m to 4.0 m
* Entrance doors of 1400 m wide and in 2 leaves, 1.3 m2 for patient and 1 m2 per escort.

**Pathology department:**

* Consists of lab, toilet & office
* Tests carried out like urine etc…
* Require sufficient space for storage.
* Space for lab not less than 18 m2
* Light - 200 to 300 lux.

 **Staff quarters are required**

 **Sanitary units:** As per NBC & byelaws

**Principles of planning a hospital:**

**Aspect:**

* Entrance door should be wide enough as a patient is usually accompanied by escorts or may be brought horizontally on stretcher.
* Large windows in sufficient numbers are essential for a hospital.

**Privacy:**

* Privacy is vital for obstetrics and gynaecology and at every level of surgery.

**Roominess:**

* Sick man requires more room compared to a healthy man. Hence wards should be more spacious.

**Grouping:**

* Casualty ward should be nearer to the entrance.
* Obstetrics and gynaecology are grouped.
* Paediatrics is also to be planned nearby.
* Similarly outpatient department and pharmacy should be close to each other.

**Circulation:**

* Separate entrances are to be provided for doctors, nurses and other hospital staff and for patients and their accompanying relatives or friends.
* Emergency entrance leading to intensive care unit should be provided nearer to the lift.
* In addition to stairs, ramps and lifts big enough to harbour stretcher on trolley should be provided for easy and efficient vertical circulation.

**Sanitation:**

* Noiselessness, free circulation of natural breeze and exposure to the morning sun keeps patients cheerful helping them to recover quickly.
* However afternoon sun is to be avoided because of intense solar insolation and so also gushing wind is to be avoided by providing sill level of windows above the bed level.
* Serene Environment is to be preserved by planning the hospital away from crowded areas and places of excess noise.
* A patient cannot tolerate loud sound or even less intense noise over a longer period.

**BUILDING BYE LAWS:**

Rules and regulations which largely regulate the building activity should be formulated to get disciplined growth of buildings and the better planned development of towns and cities.

The fundamental principles involved in building be-laws are

* Safety,
* Security,
* Comfort,
* Aesthetics
* Conformity.

**Building bye-laws:**

Minimum provisions from NBC by Town Planning Authorities, Urban Development Authorities and Municipalities, to protect the

1. Inmates living in the house
2. Neighbours and
3. Public passing by the side of the building

against structural failures, fire accidents and insanitary conditions are called Building Bye - Laws

* The building bye-laws also cover aspects of administrative regulations, general building requirements, fire protection requirement, materials and structural design, rules for design of electrical installation, lighting, air conditioning and lifts, for ventilation, acoustics and plumbing, sanitation and gas supply, measures to ensure safety of workers and public during construction, requirements for greenbelts and landscaping and rules for erection of signs and outdoor display structures.
* National Building Code has been published in 1970 by Bureau of Indian Standards to maintain uniform building regulations throughout the country for the guidance of Government departments, Municipal bodies, urban development authorities and other construction agencies.
* This National Building Code has been revised in 1983 after giving weightage to a number of comments and useful suggestions for modification and after incorporating the revised B.I.S. codes.
* This code was revised in 2005 by in corporate state of knowledge on various aspects of building construction.
* The National Building code is a single document in which the information of Bureau of Indian Standards is presented in a systematic, cogent, coherent and continuous form.
* National Building Code provisions will serve as a model for adoption by PWD's and other government construction departments, local bodies and other private construction agencies.
* Existing PWD codes, municipal bye-laws and other regulatory media could either be replaced by National building code or suitably modified to cater the local requirements in accordance with the provisions of the code.

**Objectives of building bye-laws:**

* Building bye-laws prohibit and prevent haphazard and irregular growth as ribbon development and permit disciplined and systematic growth of buildings along roads by clearly earmarking Residential Areas, commercial areas etc….
* They regulate the open space around the building, window area and head room for different rooms, thereby creating conducive conditions for natural lighting (illumination) and breeze supply to the inmates (ventilation). Also minimising traffic dangers as dust and noise.
* The standard dimensions for various structural members are specified which give strength and long life for the building.
* The bye-laws regulate the planning, design and execution of building elements so that structural and seismic failures affecting inmates of the house, neighbours and passers-by does not take place.
* The bye-laws enable the inmates to easily get access to utilities as piped water supply, electric power and connection to public sewer.
* The damage caused due to fire, structural or constructional defects shall be localised and its impact on neighbourhood is minimised.
* The growth of township is streamlined by maintaining uniform height of buildings, uniform frontage so that the abutting road is straight, gently sloping, free from blind corners and can be easily widened in future if required.

**BUILDING PLAN APPROVAL PROCEDURE AS PER NBC 2005**

**Preparation of building drawings:**

 After taking consent of owner about proposed building plan, the registered architect/engineer/supervisor/town planner/ landscape architect/urban designer/utility service engineer prepares the scale drawings and duly signed for submission to the concerned authority for necessary approval. The plans shall also be duly signed by the owner indicating his address. The drawing documents submitted to the municipality for approval should contain the following:

1. Key plan or location plan.
2. Site plan.
3. Layout plan or sub-division plan.
4. Plan, section and elevation of the proposed building.
5. Service plans.
6. Specifications, general and detailed.
7. Certificates for structural sufficiency and supervision.
8. Title of ownership of land/building.

**(i) Key plan or Location plan:**

A key plan shows the location of site with respect to neighbourhood lands/houses in layout of development works. It is drawn to a scale of not less than I in 1000. No dimension of the key plan shall be less than 75 mm. It should indicate:

 (a) The location of site.

(b) Survey number in which the site is located.

(c) Services available.

(d) Special features like industries, monumental buildings, temples, water courses, ponds if any.

 It assists in easily locating the property boundaries with reference to the existing structures.

**(ii) Site plan:**

Site plan as per NBC 2005 should be drawn to a scale of not less than 1 in 500 for an area up to one hectare and not less than 1 in 1000 for more than one hectare.

A site plan is a top view, bird's eye view of a property that is drawn to scale. It shows property boundaries and means of access to the site and nearby structures if they are relevant to the design.

1. The site plan should clearly indicates the following:
2. Size of plot.
3. Boundaries of the site.
4. Details of open space to be left-around the proposed building.
5. Name of the streets in which the building is proposed to be situated.
6. All existing building standing on, over, or under the site.
7. Indicate direction of North direction relative to the plan of the building.
8. Means of access from the street to the building.
9. Details of adjacent plots.
10. Other physical features like wells, drains, septic tank etc.
11. Compound wall, compound gates, landscape.
12. Prominent features of the site as level, sloping or undulating.

Unless the position of the building on site is known, marking for excavation of foundation cannot be done.

The entire plot area of the site should never be consumed for construction but only a maximum of 75% of the site alone should be used for construction.

**(iii) Layout plan or sub-division plan:**

* If a large area of land is to be developed, a layout plan showing the internal roads, area for plots and area allocated for amenities such as parks, school, community service centre, commercial centre etc. should be enclosed.
* It has to be approved by concerned authority with respect to sizes of each plot, widths of approach roads and allocation areas for various community services as per National Building Code 2005.
* The layout plan shall be drawn to a scale of not less than 1:500. It should clearly indicate:

(a) Scale used and indication of North direction.

(b) Location of proposed and existing roads with their widths within the land.

(c) Dimension of each plot along with building, building lines showing the setbacks with dimensions within each plot.

(d) Location of drains, sewer lines, public facilities and services and electrical lines etc.

(e) Table indicating size, area and use of all the plots in the layout plan.

(f) A statement indicating the total area of the site, area utilized under roads, open spaces for parks, play grounds, recreation spaces for parks and development plan, reservations for schools, shopping and other public places along with their percentage with reference to the total area of the site to be subdivided.

 **(iv) Plan, section and elevation of the proposed building:**

 The plan, sections and elevations of building shall be drawn to a scale of 1:100. These are essential to design the various components of building and estimate construction and maintenance cost of total building. These drawings are used by site engineer to supervise construction of buildings.

These drawing are to be submitted for the necessary approval of authority. These should contain:

(a) Floor plans of all floors.

(b) Size and spacing’s of all framing members such as columns and beams.

(c) Dimensions of all rooms, walls, passages, verandas, corridors etc.

(d) Position of stair cases, ramps and lift wells.

(e) Use or occupancy of all parts of the buildings.

(f) Exact location of essential services such sink, bath etc.

(g) Details of canopy, porch, chajja etc.

(h) At least one section through stair case.

(i) Appropriate sections showing typical arrangement of footings, foundations, basement walls, structural load bearing walls, columns, beams and partition walls, floor slab and roof slab.

(j) Terrace plan indicating drainage and slope of the roof.

(k) North direction relative to the plan.

(l) Dimensions of the projected portions beyond the permissible building line.

(m) At least one elevation from front showing the height of building and rooms and also the height of parapet, water tanks, window, ventilator, roof and architectural compositions.

**(v) Service Plans:**

The service plans shall include all details of building and plumbing services, and also plans, elevations and section of private water supply, sewage disposal system and rain water harvesting system. Electrical installations plans to show main fuse boards, ceiling fans, lamps, exhaust etc. locations and their materials specification.

**(vi) Specifications, general and detailed:**

Specifications, both general and detailed, giving type and grade of materials to be used, duly signed by the registered architect, engineer, structural engineer or supervisor.

**(vii) Certificates for structural sufficiency and supervision:**

The plans shall he accompanied by structural sufficiency certificate in the prescribed form signed by the Registered Engineer/Structural Engineer and the owner jointly to the effect that the building is safe against various loads, forces and effects including those due to natural disasters such as earthquake, landslides, cyclones, floods, etc. The structural engineer shall have the details to substantiate his design.

 **(Viii) Title of ownership of Land/building:**

Title of ownership of Land/building documents that may be used to establish the current owner of a piece of property or building is required.

**VAASTU:**

* VAASTU - Derived from Vasati (Residential accommodation)
* 5 essential elements are required for happy living.

 1. Earth

 2. Fire

 3. Air

 4. Water

 5. Sky

* Judicial balancing of these five elements keep the residents in good cheer and is responsible for their happiness.
1. **Shape of the site**
* Square gives better flexibility
* Rectangular – twice the width is given next preference.
* Rectangular shape (90° $\pm $ 5°) is favored.
* Odd shapes like triangle, pentagon, hexagon, octagon and circle were not favored – construction favors rectangular rooms with square corners.
* Odd shapes arises problems for furniture arrangement.
1. **Directions:**

Axis about which the earth rotates is not vertical but inclined at 23 $\frac{1}{2}$° to the vertical.

* + East – morning sun
	+ West – afternoon sun
	+ South – throughout the day
	+ North – least exposed to sun
	+ N E – sun in forenoon
	+ N W – afternoon sun with less intensity
	+ N E, N W, N – remains less illuminated and cooler throughout the day.
	+ More open space on north and east
	+ Less on south and west as the rooms on N and E may not get enough lighting if less spaces are left.
	+ Extension on N and E are favoured but none on South and West.
	+ Even if a site was slightly irregular shape it was accepted when the diagonal towards North – East longer than the other towards south – East .
	+ Higher walls, elevated roofs or taller trees on North and East are not favoured.
1. **Orientation:**
* In ancient days property means 1. Fertile land

 2. Cattle

* Their main profession was tilling of land and grazing of cattle.
* House is constructed adjoining tot the agricultural filed.
* Fertile land – water – main importance.
* North remains cooler so, rooms of top priority are constructed in North.
* East – morning sun – pleasant, welcome – bath – washing of limbs
* Kitchen is constructed in south East (Place of Agni), receives enough light throughout the day.
* Dining hall is kept away from the kitchen to avoid entry of smoke, fire.
* Bed room should be airy, hygienic, south gets sun throughout the day. Brighter bed room gives good physical and mental balance.
* SW is preferred to store heavy objects. N and E are less loaded. S and W are more loaded.
1. **Level Differences**

|  |  |
| --- | --- |
| **Lowest side** | **Effect** |
| North | Riches, Prosperity |
| East | Riches, Prosperity |
| North and East | Longevity, Prosperity |
| South | Adversity, ill health of housewife |
| West | End of progeny |
| North, central area and south | Total ruin |
| East, central area and west | Haunting fear of death, ill health |

1. **Main Entrance:**
* East is the first preference, North and West preferred next. South is for privacy factor.
1. **Number of Columns and Beams**
* Always number of columns and beams should be even.
1. **Number of Doors and windows**
* Number of doors and windows should be always even, but never end with 0.
* Arrangement of doors should be, they should face each other.
* Possible doors in each room should be nearer to either East or North walls of room.
* Min number on western or southern sides. Two shutters doors are prefferd.
* Door frames must possess sill, to avoid the entry of snakes or any other insects.
1. **Number of Steps:**
* Risers should odd. Intention is to place right leg first.
* Left leg resembles enmity.
1. **Well**
* NE, N or E directions – intention (nearer to the bath place)
* Also water from well, easily flows to North and East directions i.e., away from the house (drainage).
1. **Colours:**
* Black colour is not favoured, inauspicious and absorbs heat – any amount of lighting cannot brighten a black coloured room.

|  |  |  |
| --- | --- | --- |
| **Colour** | **Effect** | **Quality** |
| Orange | Cheer enthusiasm | Happiness joy |
| Blue | Cool calm | Peace solace |
| Green | Soothing comfort | Contentment |
| Yellow | Cheer activation | Intelligence ready comprehension |
| Violet | Awareness tranquility | Mediation |
| Red | Blood circulation stimulated | Joy, Love, Anger, Wrath |

1. **Position of stairs:**
* Placed west or towards south direction.
1. **Roof:**
* Eesanya (NE) should not be covered i.e., with a roof. Because north gets less light (because of sun). Rising sun rays from the E are the most welcome and not to be obstructed.
* No verandah on North and sometimes even sunshades.
1. **Characteristics of sub soil:**

Sub soil is the soil extracted at a depth of 500 mm to 1000 mm. The concrete footing of the foundation of the building is going to be laid over this sub soil.

**Colour:** White or light coloured soil is superior.

 Reddish soil is moderate.

 Greenish soil is inferior.

 Blackish soil is the most inferior.

**Odour:** Soil of sweetish odour is the best.

Soil having pungent smell is mediocre.

 Soil of grassy or goaty smell is the worst soil.

**Taste:** Soil of sweetish taste is the best

Soil of insipid taste is mediocre

 Soil of sour taste is the worst soil.

**Physical appearance:** Marshy soil,

 Soil full of bores, holes, hallows, burrows,

 Soil full of anthills are not preferred.

Soils bearing trees secreting juices, thorny trees without flowers or fruits are highly undesirable.

**Neighbourhood:** Site adjacent to place of worship, palaces of rulers, black smithy are undesirable. Site having road on E or N or on both sides is desirable