

Date ____/____/____

PART - 01

* Building Bye - laws to be practised :

Building bye - laws are essential legal provisions established to regulate and standardise construction practices, ensuring safety, efficiency and adherence to environmental norms. Below is detailed explanation of some key building bye - laws :

1. Fenestration :

Fenestration refers to the arrangement, proportion, and design of openings in a building such as windows, doors, and skylight. Key bye-law considerations include :

• Light and Ventilation :

Adequate fenestration must ensure natural light and cross.

• Ventilation :

A minimum window area of 10-15% of the floor area is typically required for habitable rooms.

• Energy Efficiency :

Use of energy-efficient glass and shading devices to minimize heat gain and reduce

energy consumption.

- Safety :

Openings should comply with fire safety regulations and include feature like escape windows in emergencies.

- Aesthetics :

Fenestration must align with the overall architectural style and proportions of the building.

Example : In high rise buildings, window must be design to withstand wind loads and ensure safety with features like safety locks or grills.

2. Ventilation :

Ventilation bye-laws focus on maintaining indoor air quality by facilitating fresh air circulation. Guidelines include :

- Natural ventilation :

Minimum ventilation area should at least 5% of the floor area for non-habitable rooms and 10% for habitable rooms.

- Mechanical Ventilation :

In spaces where natural ventilation is insufficient (e.g., basements), mechanical systems like exhaust fan must be installed.

- Cross - Ventilation :

Openings should be strategically positioned to allow cross-ventilation, reducing dependency on mechanical systems.

ex :-

Bathrooms and Kitchens must have exhaust fans or ventilators to expel odors, moisture and fumes.

3. Sills of openings :

Sills are the horizontal bottom portion of openings like windows. Bye-laws regulate their placement for safety and functionality.

- Height :

The sill height of windows in habitable rooms should not be less than 750 mm from the floor to prevent accidental falls.

- Waterproofing :

Proper sealing and waterproofing of sills to prevent water ingress.

- Materials :

Durable materials such as concrete or stone should be used to withstand weather conditions.

Example :-

For bathroom windows, sills may be positioned higher to maintain privacy.

4. Staircases :

Staircases are critical for vertical circulation and emergency evacuation. Age - laws cover :

- Width :-

Minimum staircase width should be 1.0m for residential buildings and 1.5m for public buildings.

- Risers and Treads :-

Riser height should not exceed 150 - 190 mm, and tread depth should be at least 250 - 300 mm.

Date ____ / ____ / ____

• Headroom :-

Minimum clear height of 2.1 m above staircase to avoid obstruction.

• Fire Safety :-

Fire resistant materials and emergency staircases are mandatory in high-rise building.

Example :-

Spiral staircase may be used as secondary staircase but must comply with safety dimensions.

8. Ramps :-

Ramps are crucial for accessibility and transport of goods. Bye-law specify :

• Slope :-

Maximum gradient should be 1:12 to ensure safe usage by differently-abled individuals.

• Width :-

Minimum width of 2.2 m for pedestrian ramps and 2.5 m for vehicular ramps.

- Handrails :-

Required on both sides, with a height of 850 - 1000 mm.

- Example :-

Hospital and public buildings must have ramps at entrances for wheelchair access.

6. > Roofs :-

Bye - laws for roofs focus on safety, usability and aesthetics.

- Load-bearing capacity :-

Roofs must be designed to withstand live loads, dead loads and environmental loads like wind and snow.

- Drainage :-

Proper slope and drainage systems to prevent water accumulation.

- Insulation :-

Thermal and waterproof insulation to enhance energy efficiency and durability.

- Green roofs :-

Encouraged in urban areas for environmental benefits like reducing heat island effects.

Ex :

Roof top solar panel installations must comply with bye-laws for weight and safety.

7. Parapets and Terraces :

Parapets and terraces enhance safety and usability of roofs. Regulations include :

- Height of parapets :

Minimum height of 1.0 m for residential buildings and 1.2 m for Public

- Structural integrity :

Parapets should be constructed with durable materials to resist weathering.

- Terraces :

Must have proper drainage systems to avoid water stagnation.

Example :

Roof top terraces used for recreation must include safety railings or parapets.

Date ___/___/___

2. Water tank :-

Water tanks are integral for water storage. Bye-laws govern their construction and placement.

• Location :-

Overhead tank should be placed on a stable and elevated structure. Underground tank must be waterproof and easily accessible for maintenance.

• Capacity :-

Tank size must meet the building's water consumption requirements.

• Materials :-

Tank must be constructed using non-toxic, durable materials like RCC or Polyethylene.

Example :-

Overhead tank in high-rise buildings should include overflow arrangements to prevent spillage.

9. Refuse Area / Disposal of solid waste :-

Proper waste management ensures hygiene and environmental compliance. Bye-laws mandate :-

• Refuse Area :-

Provision of designated space for temporary storage of solid waste.

• Segregation :-

separate bins for biodegradable and non-biodegradable and hazardous waste.

• Accessibility :-

Waste disposal area must be easily accessible for collection vehicles.

Multi-storey residential complexes must provide garbage chutes for easy waste disposal.

10. Discharge of Rainwater :-

Rainwater management prevents flooding and erosion. Regulation include.

• Drainage systems :-

Building must have rainwater gutters, downspouts and stormwater drains.

Date ____/____/____

• Rainwater Harvesting :- Mandatory for larger plots to conserve water and recharge groundwater.

• slope Design :-

Roofs and terraces must have a proper slope to direct rainwater toward designated outlets.

ex :-

Urban areas may require detention tanks to store excess rainwater and prevent drainage system overload.

4. Provision of Letterbox :-

Letterboxes are essential for communication and postal services. Bye-law mandate:

• Location :-

must be placed in an easily accessible location, such as near the main entrance.

• Size :- sufficient size to accommodate typical postal item.

• Material :- Durable material to withstand weather and vandalism.

Example :- High rise building may have centralized letterboxes for all units.

#. Margin of and maximum built area :-

*. Margin :-

Margin are the minimum open spaces that must be maintained between the building and boundaries of its plot.

- Purpose: insure Adequated light, ventilation, safety and privacy
- Standards vary depending on the type of building (residential, commercial or industrial) and local regulation
- Front margin are typically larger than rear or side margins
- High rise building requires larger margins due to safety concern

*. Maximum built area :-

The built up area is the total area covered by the building, including walls and structural elements. The maximum allowable built area is determine by local by laws and Zonic regulation

- Expressed as a Percentage of the total plot area
- Distribution Restriction insure the compliance with lower space index (F.S.I) limits

Ex :-

If a plot has an area of 500 sq.m and the permissible area is 60% the maximum built area is 300 sq.m.

Plinth areas for different types of buildings :-

The plinth area refers to the covered built up area measured at the floor level of a building.

(i) Residential building :-

- Typically include living rooms, kitchen, bathrooms and internal walls.
- Balconies and verandas may or may not be included, depending on local regulation.

(ii) Commercial building :-

- Includes areas used for business operation, storage and customer interaction.
- Common areas like lobbies and corridors are usually counted.

(iii) Industrial building :-

Includes production floors, storage and office spaces within the premises.

(vi) Exclusion :-

Open terraces, loops and Projections are generally not included in the Plinth area calculation.

Permissible built Area in margin :

- Construction in margin is typically to allow for open spaces and utilities.
- certain Projection, such as balconies or sunshades may be permissible within specified limits.
- Local authorities may permit specific uses, such as garden sets or garages in the margin provided safety and aesthetic concerns are addressed.

Projection in margins :

Projections are structural extensions beyond the main walls of a building such as balconies, sunshades or cantilevers structures.

(i) Permissible Projection :

- Typically allowed up to a certain percentage of a margin width (0.6 m x 2 m margin)
- Must not obstruct light, ventilation and access.

Date ____ / ____ / ____

(ii) Regulation :-

- Projection in front margin are usually more stricted than side or rear margins.
- Projection should not extend into public spaces or roads.

Margin from Common Plot :

- A Common Plot is a shared open space in residential or commercial complexes.
- Bye-laws mandate a specific margin distance between building and the common plot to ensure accessibility and utility.
- Common plot areas are usually landscaped or used for recreational purpose.

Open Spaces :

Open spaces are unbuilt areas within a plot reserved for ventilation, recreation or landscaping.

(i) Purpose :-

- Promote environmental sustainability.
- Provide recreational area for occupants.

Date ____ / ____ / ____

(ii) Standards :-

- The Percentage of open space required varies based on the Plot reserved size and building type.

Ex:- In residential zone, a minimum of 20-30% of the Plot area may be mandated as Open Space.

→ Floor Area Ratio (FAR) :

Floor Area Ratio (FAR), or floor space index (FSI), is the ratio of the total floor area of a building to the size of the Plot.

→ Formula :-

$$FAR = \frac{\text{Total floor area}}{\text{Plot Area}}$$

→ Purpose :-

- Regulate building density.
- Prevents overcrowding and ensure adequate infrastructure.

→ Regulations :-

- Vary by Zone (residential, commercial, or industrial)
- Higher FAR is allowed in urban areas with better infrastructure.

Date ____ / ____ / ____

Carpet Area :

The carpet area refers to the usable floor area within the walls of a building, excluding the thickness of walls and other non-usable spaces like balconies or verandahs.

(i) Components :-

- Includes rooms, kitchens, and bathrooms.
- Excludes common areas like lobbies or staircase.

(ii) Purpose :

- Represents the actual usable space available to occupants.

Key Plan (Layout plan) :

A key plan provides a small-scale overview of the entire layout of a site.

(i) Details included :-

- Boundaries and access roads.
- Placement of plots of buildings.
- Location of amenities like parks and utilities.

Date ___/___/___ PART - 03

Factors Affecting Building Planning :

Building Planning depends on several factors that ensure the proposed structure is practical and aligns with user requirements, environmental regulations, and local bye-law.

a) Purpose of the building :

- The intended use of the building (residential, commercial, industrial or institutional) dictates its design, layout and facilities.
- For example, a residential building requires bedrooms, kitchens and living areas, while a hospital needs specialized rooms for patients, operation theaters, and emergency services.

b) User Requirements :

- The size, preferences, and lifestyle of the occupants influence the layout and space allocation within the building.

Date ____/____/____

c) Budget Constraints :

- Financial limitations dictate the choice of materials, design complexity, and overall scale of the project.

d) Local Building Bye-Law :

- Compliance with regulations like permissible height, setbacks, floor area ratio (FAR), and open spaces is mandatory.

e) Future Expansion Needs :

- Planning must consider the possibility of future expansions or modifications.

f) Environmental Impact :

- Green building practice, energy efficiency, and waste management are critical for sustainable construction.

2) Shape, size, and Topography of the site :

a) Shape of the site :

- The site shape determines the building's layout and orientation.

Date ____ / ____ / ____

- Rectangular plots are ideal for planning and allow efficient space utilization.
- Irregular plot may require customized layouts to optimize usability.

b) Size of the Site :

- The plot size influences the type of building that can be constructed.
- Large plots allow flexibility in design and space allocation for landscaping or parking.
- Smaller plot may require vertical expansion to maximize usable space.

c) Topography of the Site :

- The natural features of the site, such as slopes, elevation, and soil conditions, significantly impact planning.
- Flat Terrain : Easier to develop and economical for construction.
- Sloped Terrain : Requires additional planning for retaining walls, drainage and levelling.
- Rocky or sandy soil : Demands soil testing and specialized foundation design.

Date ____ / ____ / ____

d) Natural Obstacles :

Existing features like trees, rocks, or water bodies must be considered and preserved wherever possible to enhance the aesthetics and environmental value of the building.

3) Climatic Conditions of the Site :

Climatic factors directly influences the design and orientation of a building to ensure comfort, energy efficiency and durability.

a) Temperature and Sunlight :

- Buildings in hot regions should minimize heat gain by incorporating shaded windows, light - coloured walls, and green roofs.
- In colder regions, design must maximize sunlight exposure using larger south-facing windows and heat-insulating materials.

b) Rainfall and Humidity :-

- High-rainfall require slooping roofs, efficient drainage systems and water-resistant construction materials.

- Adequate Ventilation is necessary in humid regions to prevent dampness and mold growth.

c) Wind patterns :

- Wind direction and speed influence the placement of windows, ventilation systems, and structural stability.
- Building in cyclone-prone areas require wind-resistant design and reinforced structures.

d) Seismic Zones :

Sites in earthquake-prone areas must follow seismic design codes, such as flexible joints and shock-absorbing materials, to enhance safety.

e) Orientation of the building :

Proper orientation ensures optimal use of natural light, ventilation, and solar energy while reducing energy consumption.

Example : In tropical climates, buildings should face north or northeast to avoid direct sunlight.

4) Safety precautions During Building construction as per NBC

The national Building Code (NBC) to India provides guidelines to ensure safety at construction sites. These precautions aim to protect workers, prevent accidents, and ensure compliance with statutory regulations.

a) Site Preparation and Risk Assessment :-

- Conduct thorough surveys to identify hazards like weak soil, underground utilities, or proximity to other structures.
- Demarcate the site with barriers and warning signs to prevent unauthorized access.

b) Structural Safety :-

- Use scaffolding, ladders, and supports systems designed to handle the expected load.
- Inspect equipment like cranes and lifts regularly to ensure they are in working condition.

c) Personal Protective Equipment (PPE) :-

- Provide workers with helmets, gloves, safety shoes, goggles and reflective vests.

Date ___/___/___

- Ensure proper use of PPE through regular training sessions.

d) Fire Safety :

- Install fire extinguishers and maintain clear evacuation routes.
- Use non-flammable materials wherever possible and ensure electrical wiring is properly insulated.

e) Material storage and Handling :

- Store materials like cement and steel in designated areas to prevent accidents.
- Follow proper lifting techniques and use machinery to handle heavy loads.

f) Safety During Excavation :

- Secure excavation sites with barriers and warning signs.
- Ensure proper grounding shoring and drainage systems and avoid overloading circuits.

Date ____/____/____

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g) Electrical Safety :-

- Use insulated tools and equipment.
- Ensure proper grounding of electrical systems and avoid overloading circuits.

h) Health and Hygiene :-

- Provide clean drinking water, sanitation facilities, and first aid kits on-site.
- Train workers on handling emergencies and administering basic medical aid.

i) Waste Waste Management :-

- Segregate and dispose of construction waste according to environmental regulations.
- Implement recycling practices wherever possible.

UNIT-08

Saathi

Date ___/___/___

PART - 01

Introduction of Plumbing :

Plumbing is a critical aspect of building construction that involves the installation of systems to insure the effective transportation of water for various purposes, such as drinking, washing, heating and sanitation. It also encompasses waste removal systems and the drainage of rain water. Proper plumbing design and execution are essential for the functionality, safety and durability of any structure.

One of the fundamental components of plumbing systems is the selection of appropriate pipe material. These materials must meet specific requirements such as durability, resistance to corrosion, ease of installation and suitability for the intended application.

Below is a detailed and comprehensive discussion of the various pipe materials used in building construction works for water supply.

(i) Plastic Pipe :-

Plastic pipes are widely used in modern plumbing due to their lightweight,

flexibility and resistance to crosen.

A. • Types of Plastic Pipe :

(i) PVC (Poly Vinyl chloride) :-

- commonly used for cold water supply and drainage system.
- Advantages cost effective, non-corrosive and light weight.
- Limitation can not be stand high temperature making it unsuitable for hot water supply.

(ii) CPVC (Chlorinated Poly Vinyl chloride) :-

- Ideal for hot and cold water supplying system.
- Advantages high temperature resistance, durability and resistance to chemical reaction.

(iii) uPVC (unplasticized Poly Vinyl chloride) :-

- Primary used for external plumbing and sewer system.
- Advantages high tensile strength and chemical resistance.

B. Advantages of Plastic Pipe :

- Lightweight and easy to transport.
- Simpled installed using solvent cement or adhesive.
- Smooth inner surfaces reduce friction losses, insuring efficient water flow.
- Resistance to chemical reaction and crosen.

C. Limitation :

- Not Suitable for very high Pressure Application.
- Some types may degrade under prolonged exposure to sunlight or heat.

2. High density Poly ethylene Pipes (HDPE) :

are a ~~newer~~ ^{newer} generation of Plastic Pipes known for their strength flexibility and durability.

A. Application :

- Suitable for water supplying in residential, commercial and industrial building.
- Used in underground installation due to their high resistance external Pressure and impact.

B. Advantages :-

- Extremely durable and resistance to corrosion.
- Flexible allowing for easy installation in areas with uneven terrain.
- Can withstand high pressure and are suitable for large scale water distribution system.
- Non toxic, making them ideal for portable water supply.

C. Limitation :-

- Higher initial cost compared to traditional plastic pipe.
- Require specialized tools for joining and bedding welding.

3. Densified cast iron pipes :-

Cast iron pipes have been used for century in plumbing due to their robustness durability.

A. Application :-

- Commonly used for underground drainage and sewer sewer systems.

- Also utilized for soil and waste disposal in buildings.

B. Advantages :-

- Highly durable and resistant to external impact
- Fire resistant and capable of withstanding high temperatures.
- Provides excellent noise insulation, making it suitable for multi story building.

C. Limitation :-

- Heavy and difficult to transport and install.
- Internal corrosion unless coated with protective lining.
- Requires regular maintenance and proper joining to prevent leaks.

4. ^{new} Galvanized iron (GI) Pipes :-

Pipes are steel pipes coated with a layer of zinc to prevent rust and corrosion.

A. Application :-

- Widely used for water supply in residential

and commercial area.

- Common in old pumping system and for outdoor installation.

B. Advantages :

- Durable and resistant to rust for a considerable period.
- Strong and capable of withstanding high pressure.
- Suitable for both hot and cold water supply.

C. Limitation :

- Over time, the zinc coating can wear off, leading to rust and reduce water quality.
- Heavier than plastic pipe.
- Making installation more labour intensive.
- Prone to scaling, which can reduce water flow.

8. Stone ware pipe :-

Stoneware are made from natural clay materials and are primarily used for drainage system.

Date ___/___/___

A. Application :-

- Commonly used for underground sewer lines and storm water drainage.

B. Advantage :-

- Highly resistant to corrosion and chemical reaction.
- Long lasting and suitable for harsh environmental condition.
- Cause cost effective for non pressurized system.

C. Limitation :-

- Brittle and ductile prone to cracking under heavy load.
- Installation required careful handling and proper bedding.

6. Concrete Pipes :-