

# GUIDE FOR USING NATIONAL BUILDING CODE OF INDIA 2016



भारतीय मानक ब्यूरो  
BUREAU OF INDIAN STANDARDS



# **Guide for Using National Building Code of India 2016**



**भारतीय मानक ब्यूरो**

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# About

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**Bureau of Indian Standards (BIS)** is the National Standards Body of India established under the BIS Act 2016 for development of standards, marking and quality certification of goods and for matters connected therewith or incidental thereto. BIS has been providing traceable and tangible benefits to the national economy in a number of ways – ensuring provision of safe reliable quality goods; minimizing health hazards to consumers; promoting exports and imports substitute; control over proliferation of varieties, etc through standardization, certification and testing.



The **National Building Code of India 2016** (NBC 2016), a comprehensive building Code prepared by BIS, is a national instrument providing guidelines for regulating the building construction activities across the country. It serves as a Model Code for adoption by all agencies involved in building construction works, be the Public Works Departments, other government construction departments, local bodies or private construction agencies. The Code mainly contains administrative regulations, development control rules and general building requirements; fire safety requirements; stipulations regarding materials, structural design and construction (including safety in construction); building and plumbing services; landscaping and outdoor display structures; approach to sustainability; and asset and facility management.



Thus, the Code gives all the information required by the architect, engineer, structural engineer, construction engineer, services engineer and other professionals from the early stages of planning to translating the building on to *terra firma*. The comprehensive NBC 2016 contains 13 Parts some of which are divided into Sections and Subsections totalling 33 chapters (refer page ii).



# NBC 2016 at a glance

## VOLUME 1

- Part 0 Integrated Approach – Prerequisite for applying provisions of the Code
- Part 1 Definitions
- Part 2 Administration
- Part 3 Development control rules and general building requirements
- Part 4 Fire and life safety
- Part 5 Building materials
- Part 6 Structural design
  - Section 1 Loads, forces and effects
  - Section 2 Soils and foundations
  - Section 3 Timber and bamboo
    - 3A Timber
    - 3B Bamboo
  - Section 4 Masonry
  - Section 5 Concrete
    - 5A Plain and reinforced concrete
    - 5B Prestressed concrete
  - Section 6 Steel
  - Section 7 Prefabrication, systems building and mixed/composite construction
    - 7A Prefabricated concrete
    - 7B Systems building and mixed/composite construction
  - Section 8 Glass and glazing

## Part 7 Construction management, practices and safety

## Part 8 Building services

- Section 1 Lighting and natural ventilation
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- Section 3 Air conditioning, heating and mechanical ventilation
- Section 4 Acoustics, sound insulation and noise control
- Section 5 Installation of lifts, escalators and moving walks
  - 5A Lifts
  - 5B Escalators and moving walks
- Section 6 Information and communication enabled installations

## Part 9 Plumbing services (including solid waste management)

- Section 1 Water supply
- Section 2 Drainage and sanitation
- Section 3 Solid waste management
- Section 4 Gas supply

## Part 10 Landscape development, signs and outdoor display structures

- Section 1 Landscape planning, design and development
- Section 2 Signs and outdoor display structures

## Part 11 Approach to sustainability

## Part 12 Asset and facility management

## VOLUME 2



# Introduction

The National Building Code of India (NBC 2016) is a national instrument providing guidelines for regulating the building construction activities across the country. This Guide has been prepared to help the readers of the NBC 2016 in using the Code, understanding the contents of various Parts/Sections and their connection. The key contents and concepts of each part are laid out using infographics and simplified language such that all stakeholders including officials from regulatory and other government departments, private developers, builders, contractors, professionals, academicians, and students from different backgrounds can get an understanding of the information provided within the Code.

This guide summarizes the key sections of each part of NBC. For details, please refer to NBC with latest amendments.





## Part 0 Integrated Approach– Prerequisite for Applying Provisions of the Code

### Key Content

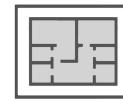
This Part gives an overall direction for practical applications of different aspects of spatial planning, designing and construction of buildings, and laying of services. It proposes an integrated approach for utilizing appropriate knowledge and experience of qualified professionals during the entire life cycle of a development/building project.

### Part 0 at a glance

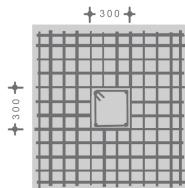
A development/building project and the built facility comprises 6 major stages.



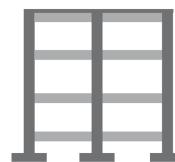
1 Location/Siting



2 Conceptualization and Planning



3 Designing and Detailing



4 Construction/Execution



5 Operation and Maintenance

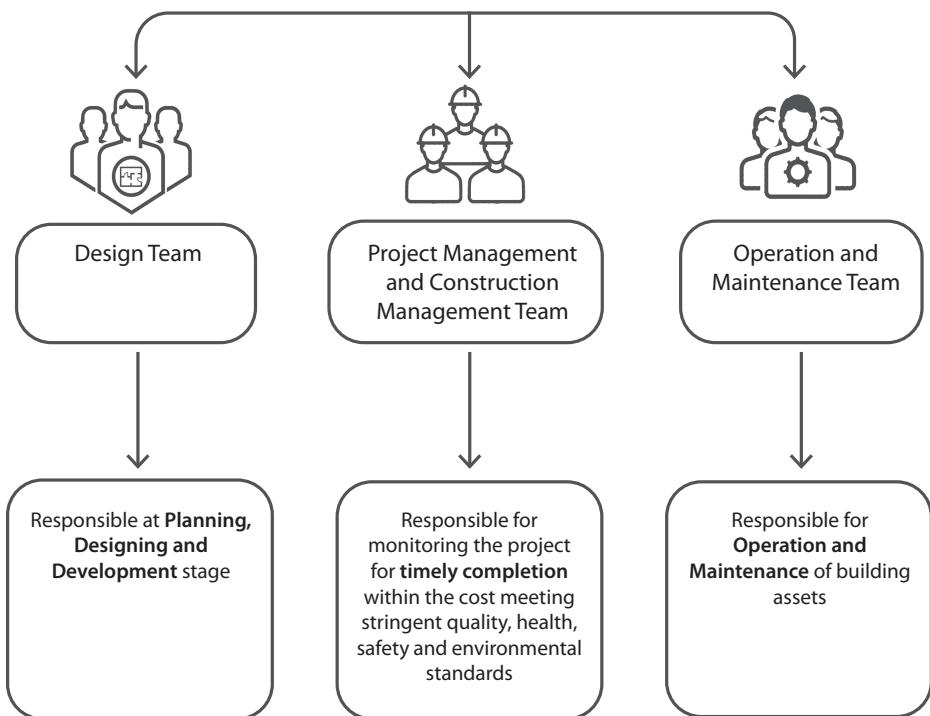


6 Decommissioning and Deconstruction



### Key Teams of Multidisciplinary Professionals

Architect; Civil engineer; Structural engineer; Geotechnical engineer; Electrical engineer; Plumbing engineer; Fire protection engineer; HVAC engineer; Lift, escalator and moving walk specialist; Acoustics specialist; Information/Communication technology engineer; Health, safety and environment specialist; Environment/Sustainability specialist; Town planner; Urban designer; Landscape architect; Security system specialist; Interior designer; Quantity surveyor; Project/Construction manager; Accessibility and universal design specialist; Asset/Facility manager; and other subject specialists.



Depending on the complexity and magnitude of the project, a multidisciplinary team of professionals need to be engaged as a well-coordinated team to achieve the desired delivery in an effective manner.



For more details on Part 0, please refer to NBC 2016





# Part 1 Definition

## Key Content

There are approximately 1,776 terms defined in NBC 2016. Each Part or Section of the NBC gives the definitions of the important terms used in it, which may be found in the clause 'Terminology' for each Part/Section of NBC 2016.

## Part 1 at a glance

Part 1 gives an index of all such definitions and directs the user to refer to the correct Part/Section for locating the desired definition. Examples of terms whose definitions are covered in various Parts/Sections are:

Part 0 Integrated Approach– prerequisite for applying provisions of the Code	Authority having jurisdiction/Authority, Building, Owner,....
Part 2 Administration	Development, Unsafe building, Sanctioned plan, Permit, Alteration,....
Part 3 Development Control Rules and General Building Requirements	Open space, Floor Area Ratio (FAR), Building height, Chajja, Covered area, Habitable room,....
Part 4 Fire and Life Safety	Exit, High rise building, Refuge area, Evacuation Lift, Horizontal Exit,....
Part 6 Structural Design	Column, Structural timber, Curtain wall, Load bearing wall, Poisson's ratio, Prestressed concrete, Diaphragm,....
Part 7 Construction Management, Practices and Safety	Scaffold, Wall opening, Platform, Pile rig, Construction equipment,....
Part 8 Building Services	Daylight factor, Glare, Cable, Building energy simulation, Ambient noise, Lift car,....
Part 9 Plumbing Services	Service pipe, Storage tank, Water outlet, Soil pipe, Municipal solid waste,....
Part 10 Landscape Development, Signs and Outdoor Structures	Contour, Gradient, Green roof, Permeable paving, Sign, Advertising sign,....
Part 11 Approach to Sustainability	Embodied energy, Environmental impact, Indoor air quality, Renewable Source, Thermal comfort,....
Part 12 Asset and Facility Management	Building management system, Facility, End user, Housekeeping, Operational strategy,....



For more details on Part 1, please refer to NBC 2016



## Part 2 Administration

### Key Content

This Part describes organization of a building department for enforcement of the Code including procedure for obtaining development, building and occupancy permits; responsibility of the owner and all professionals involved in planning, design and construction of the building.

#### Organization and Enforcement

- Department of buildings
- Appointment of team of building officials
- Qualification of building officials
- Delegation of powers
- Powers and duties of team of building officials
- Board of appeals
- Violation and penalties
- Power to make rules

#### Permit and Inspection

- Application for development, building permit
- Responsibilities and duties of the owner
- Validity
- Architectural control
- Inspection, occupancy permit and post-occupancy inspection
- Unsafe building
- Demolition of building

### Key Stakeholders



Owner/Developer



Authority having jurisdiction (called Authority)



Architect



Civil Engineer



Structural Engineer



Geotechnical Engineer



Supervisor



Town Planner



Landscape Architect



Urban Designer



Engineers for Utility Services



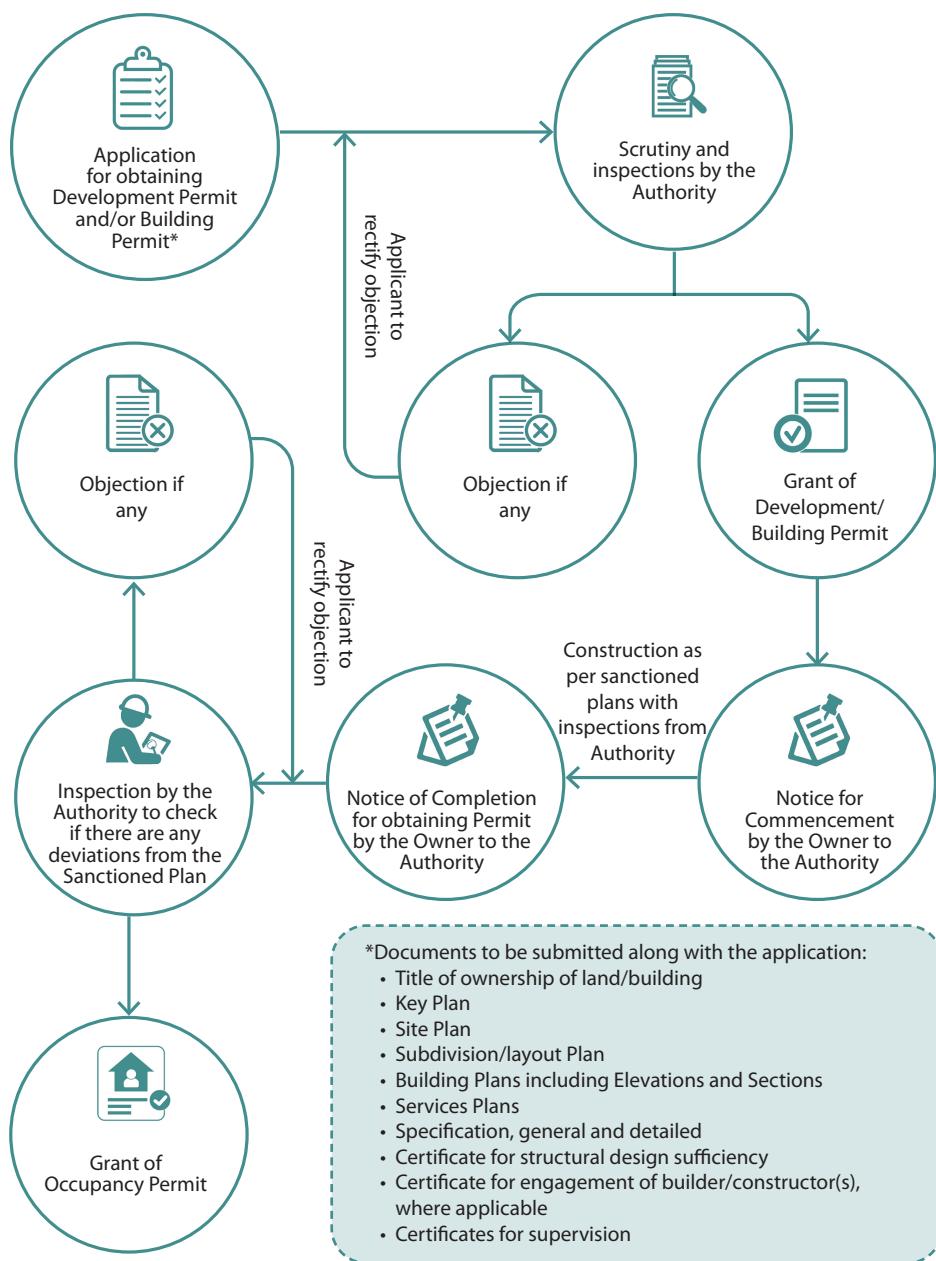
Builder/Constructor



For qualifications and competencies of professionals, refer to Annex A of Part 2 of NBC 2016



## Part 2 at a glance



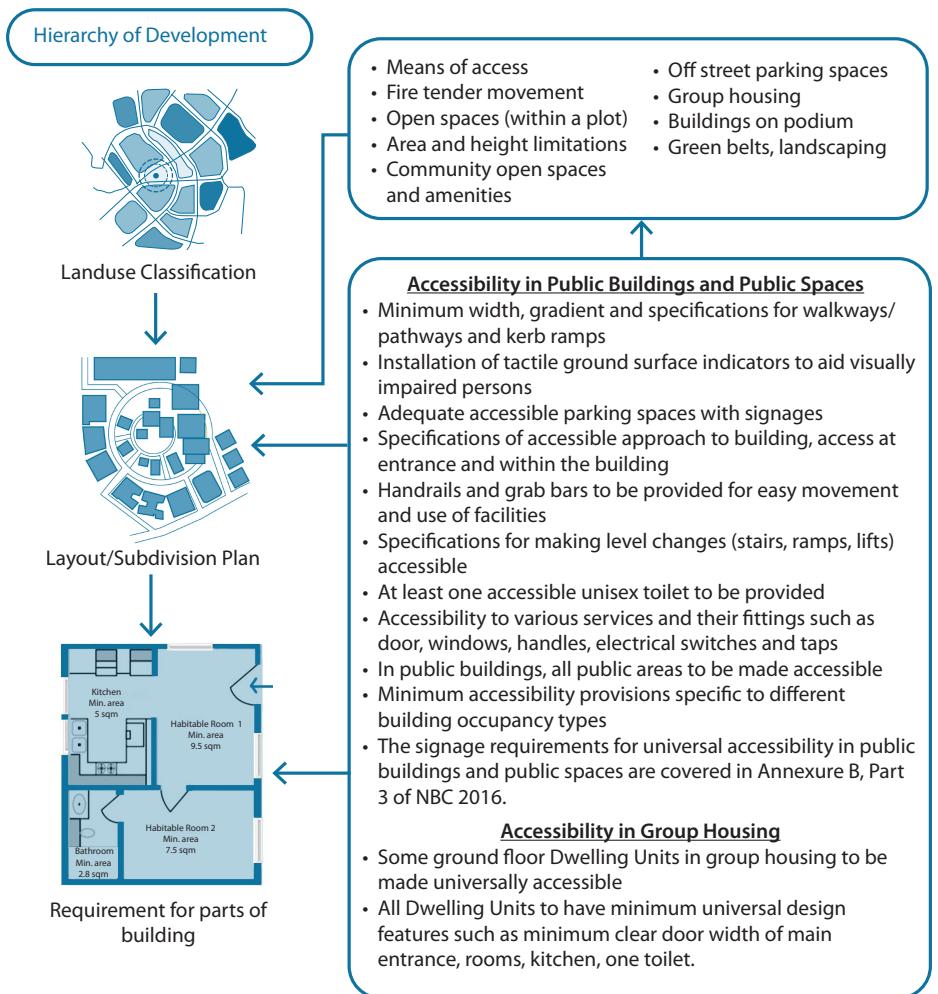
For more details on Part 2, please refer to NBC 2016



## Part 3 Development Control Rules and General Building Requirements

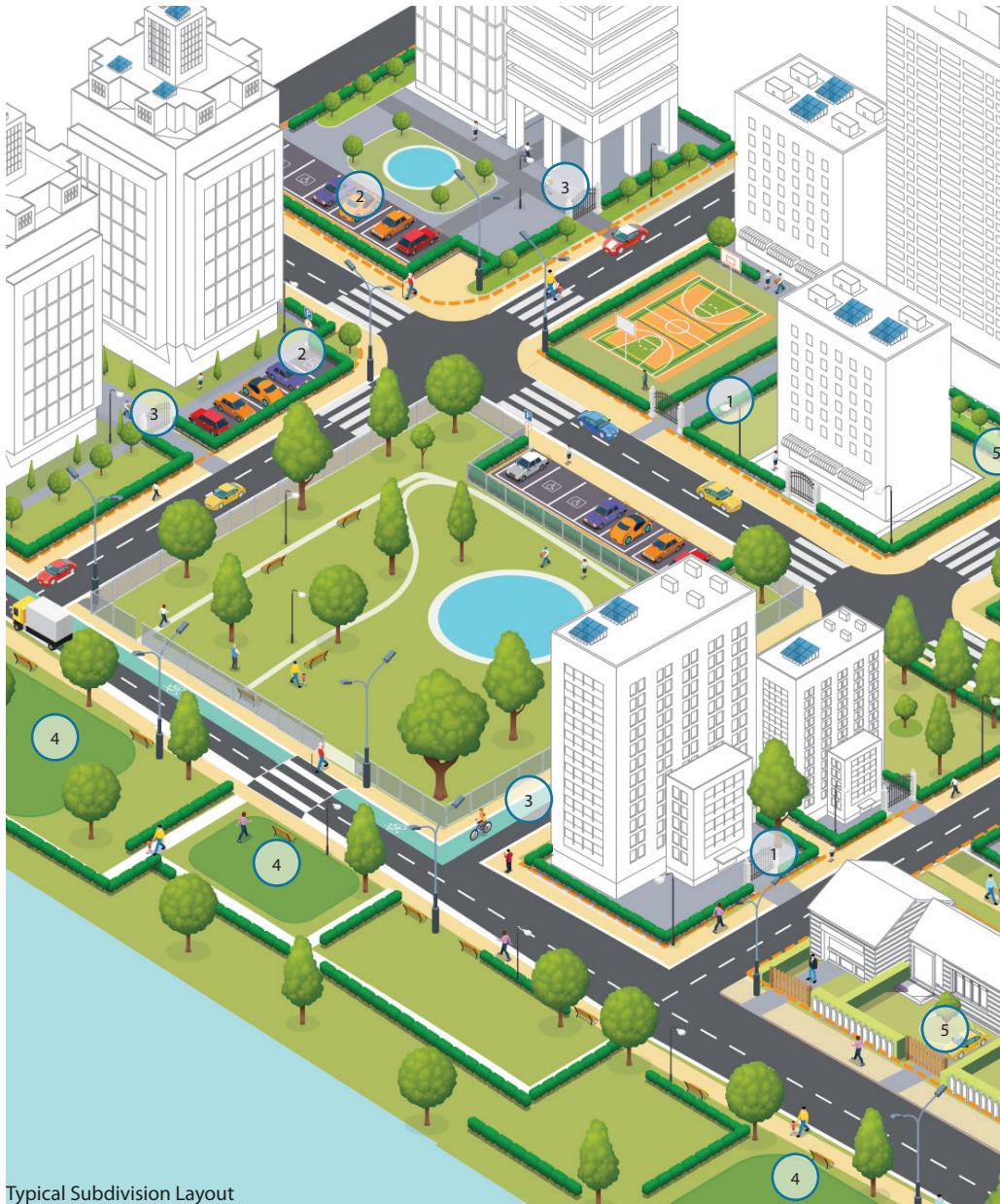
### Key Content

This Part covers development control rules such as land use classification, requirements for subdivision and layout plan including means of access, open spaces, plot requirements, area and height limitations, off street parking spaces, green belts and landscaping. This Part also covers general building requirements for various parts of building and accessibility requirements in the built environment.



This Part also covers requirements for low income housing in urban areas, cluster planning, low income habitat planning in rural areas and development planning in hilly areas.

## Part 3 at a glance



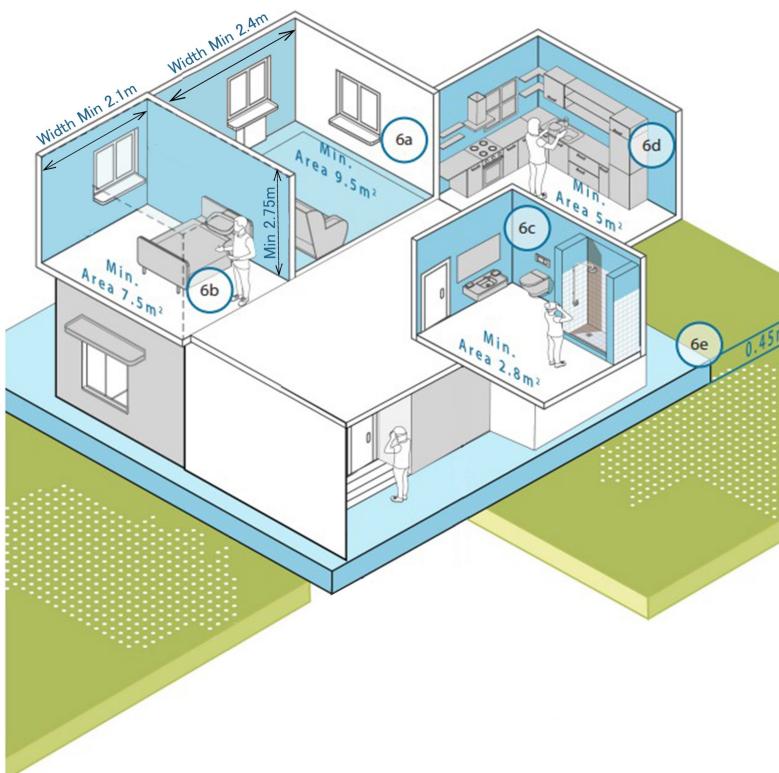
Typical Subdivision Layout

- Key:
- 1) Open spaces (around buildings)
  - 2) Off-street parking spaces
  - 3) Means of access connecting different layouts
  - 4) Greenbelts and landscaping
  - 5) Provisions regarding plot sizes and frontage
- 6) General Building Requirements  
(Check next page for details)



## Some requirements for parts of building as per Clause 12 of Part 3 of NBC 2016

- 6a) Habitable room 1 (Minimum area 9.5 m<sup>2</sup> and minimum width 2.4 m)
- 6b) Habitable room 2 (Minimum area 7.5 m<sup>2</sup> and minimum width 2.1 m)
- 6c) Toilet (Minimum area with W.C. 2.8 m<sup>2</sup>)
- 6d) Kitchen (Minimum area 5 m<sup>2</sup> without dining)
- 6e) Plinth height (Minimum height 0.45 m for plain areas/hilly area and 0.6 m flood prone )



For more details on Part 3, please refer to NBC 2016





## Part 4 Fire and Life Safety

### Key Content

This Part deals with safety from fire. It specifies the demarcation of fire zones, restrictions on construction of buildings in each fire zone, classification of buildings based on occupancy, types of building construction according to fire resistance of the structural and non-structural components and other restrictions and requirements necessary to minimize danger to life from fire, smoke, fumes or panic before the buildings can be evacuated. The provisions covered in this Part are divided in three broad areas: Fire Prevention, Life Safety and Fire Protection.

### Part 4 at a glance



<ul style="list-style-type: none"><li>Classification of buildings based on occupancy, from fire safety point of view</li><li>Demarcation of fire zone</li><li>Types of building construction</li><li>Openings in fire resistant walls and floors</li><li>Electrical installations</li><li>Escape lighting and exit signage</li><li>Air conditioning, ventilation and smoke control</li><li>Heating</li><li>Glazing</li><li>Surface interior finishes</li><li>Fire Command Centre (FCC)</li></ul>	<ul style="list-style-type: none"><li>General exit requirements</li><li>Occupant load</li><li>Egress components<ul style="list-style-type: none"><li>Exit access</li><li>Exit</li><li>Exit discharge</li></ul></li><li>Compartmentation</li><li>Smoke control</li><li>Gas supply</li><li>Hazardous areas, gaseous, oil storage yard, etc</li><li>Fire Officer</li><li>Fire drills and fire orders</li></ul>	<ul style="list-style-type: none"><li>Requirements for firefighting installations (refer Table 7)</li><li>Maintenance of firefighting installation and systems</li></ul>
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### Additional occupancy wise requirements

**Additional** fire safety requirements for high rise building, atrium, commercial kitchen, car parking facilities, metro stations, metro trainways and measures for venting in industrial buildings, are also covered in this Part of NBC 2016.



All buildings shall satisfy minimum requirements for safety of life from fire, smoke, fumes or panic arising from these or similar causes.

## FIRE PREVENTION

### Classification of buildings based on occupancy.

The city or area under the jurisdiction of the Authority shall be demarcated into distinct fire zones depending upon the existing layout, types of building construction, classification of existing buildings based on occupancy and expected future development of the city or area. Intermixing of hazardous occupancies should not be allowed in other zones.

Fire Zone 1

- **Group A: Residential Buildings**
  - Subdivision A-1 Lodging and rooming houses
  - Subdivision A-2 One or two family private dwellings
  - Subdivision A-3 Dormitories
  - Subdivision A-4 Apartment houses
  - Subdivision A-5 Hotels
  - Subdivision A-6 Starred Hotels
- **Group B: Educational Buildings**
  - Subdivision B-1 Schools up to senior secondary level
  - Subdivision B-2 All others/training institutions
- **Group C: Institutional Buildings**
  - Subdivision C-1 Hospitals and sanatoria
  - Subdivision C-2 Custodial institutions
  - Subdivision C-3 Penal and mental institutions
- **Group D: Assembly Buildings**
  - Subdivision D-1 Buildings with stage and fixed seats over 1,000 persons
  - Subdivision D-2 Buildings with stage and fixed seats upto 1,000 persons
  - Subdivision D-3 Buildings without permanent stage, accommodation for 300 or more persons, and no permanent seating arrangements
  - Subdivision D-4 Buildings without permanent stage, accommodation less than 300 persons, and no permanent seating arrangements
  - Subdivision D-5 Temporary structures designed for assembly
  - Subdivision D-6 Shopping malls with multiplexes and food courts
  - Subdivision D-7 Underground and elevated mass rapid transit system
- **Group E: Business Buildings**
  - Subdivision E-1 Offices, banks, professional establishments
- **Group F: Mercantile Buildings**
  - Subdivision F-1 Shops, stores departmental stores (area upto 500 m<sup>2</sup>)
  - Subdivision F-2 Shops, stores departmental stores (area > 500 m<sup>2</sup>)
  - Subdivision F-3 Underground shopping centres

Fire Zone 2

- **Group E: Business Buildings**
  - Subdivision E-2 Laboratories, outpatient clinics, research establishments, libraries and test houses
  - Subdivision E-3 Electronic data processing centres, computer installations,information technology parks and call centres
  - Subdivision E-4 Telephone exchanges
  - Subdivision E-5 Broadcasting stations, T.V. stations and air traffic control towers
- **Group G: Industrial Buildings**
  - Subdivision G-1 Buildings used for low hazard industries
  - Subdivision G-2 Buildings used for moderate hazard industries

Fire Zone 3

- **Group G: Industrial Buildings**
  - Subdivision G-3 Buildings used for high hazard industries
- **Group H: Storage Buildings**
- **Group J: Hazardous Buildings**



## 1) Fire resistant walls, floors and compartments

- To limit the spread of fire
- No compromise for openings such as shafts, refuse chutes, vertical openings, etc.

## 2) Shafts

- To be provided with fire resistant rated inspection door for passage of building services such as cables, electrical wires, telephone cables, plumbing pipes, etc depending upon location.

## 3) Refuge area

- An area within the building for a temporary use during egress. It generally serves as a staging area which is protected from the effect of fire and smoke.

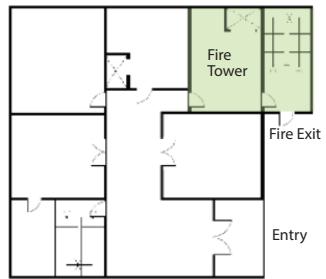
## 4) Fire detection and firefighting installations

- These include fire alarm, fire extinguishers, hose reels, wet riser, down comer, yard hydrants, sprinklers, deluge system, water spray, foam, water mist systems, gaseous or dry powder system, water storage tanks and pumps, etc.



All buildings shall satisfy minimum requirements, for safety of life from fire, smoke, fumes or panic arising from these or similar causes.

Key Plan (First Floor Plan)

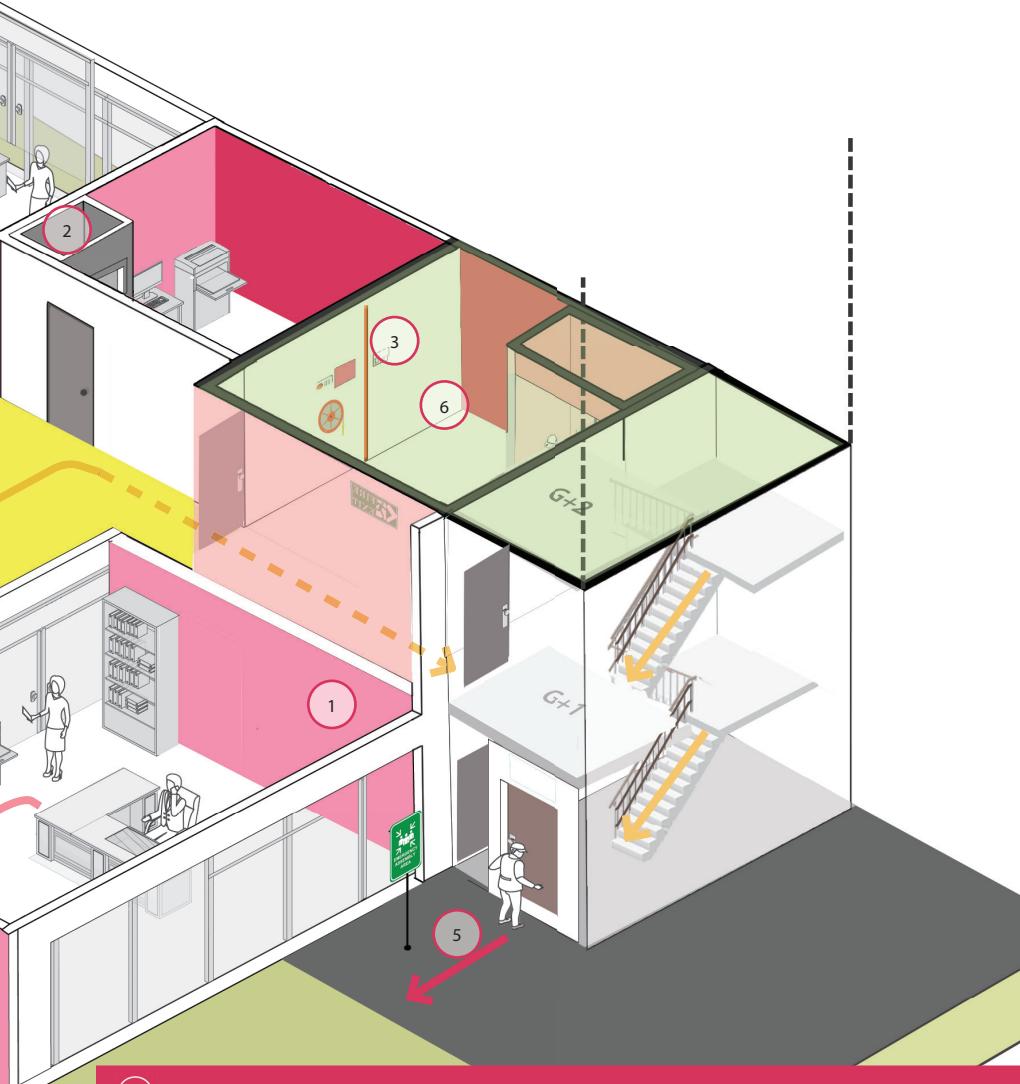


### 5) Means of egress

- Consists of three separate and distinct parts, that is, exit access, exit and exit discharge
- Exit access are working/functional areas
- Various types of exit access and exits are doorways, corridors and passageways, horizontal exits, internal staircases, exit passageways, external staircases and ramps.

### 6) Fire fighting shafts

- With fire man talk back, fire door, wet riser, hose reel, signage showing floor plan and stairways and fire man's lift





## Part 5 Building Materials

### Key Content

This Part covers the requirements of building materials and components, criteria for accepting new or alternative building material. It details the quality and effectiveness of building materials used in the construction and of their storage, which are important aspects of building activity.

- Methods of Test
- Third Party Certification
- Materials
- Storage of Materials
- Sustainable Materials
- New or Alternative Materials

### Part 5 at a glance

All building materials shall conform to relevant Indian Standards, unless otherwise specified or approved. NBC 2016 enlists around 1500 IS code specifications and methods of test under the following 30 categories of materials.

1. Aluminium and other light metals and their alloys	2. Bitumen and tar products	3. Bricks, blocks and other masonry building units	4. Builder's hardware	5. Building chemicals	6. Building lime and products
7. Clay and stabilized soil products	8. Cement and concrete	9. Composite matrix products	10. Conductors and cables	11. Doors, windows and ventilators	12. Electrical wiring, fittings and accessories
13. Fillers, stoppers and putties	14. Floor covering, roofing and other finishes	15. Glass	16. Gypsum based materials	17. Mortar (including sand for mortar)	18. Paints and allied products
19. Polymers, plastics and geosynthetics/geotextiles	20. Sanitary appliances and water fittings	21. Steel and its alloys	22. Stones	23. Structural sections	24. Thermal insulation materials
25. Threaded fasteners, rivets and nails	26. Timber, bamboo and other lignocellulosic building materials	27. Unit weights of building materials	28. Waterproofing and damp-proofing materials	29. Welding electrodes and wires	30. Wire ropes and wire products



For more details on Part 5, please refer to NBC 2016

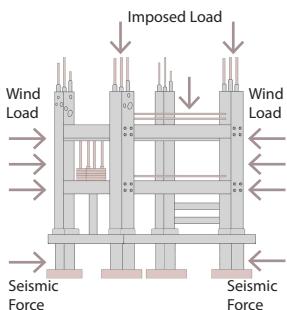


# Part 6 Structural Design

## Key Content

This Part provides for structural adequacy of buildings and usage of materials and technology for building design. It is divided into 8 Sections (Section 1 to Section 8).

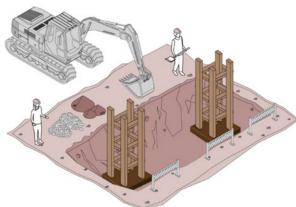
### Part 6 at a glance



#### Section 1 Loads, forces and effects

This Section covers basic design loads to be considered for the structural design calculations of buildings. The imposed loads, wind loads, seismic forces, snow loads and other loads are minimum working loads which should be taken into consideration for purposes of design. This Section also covers:

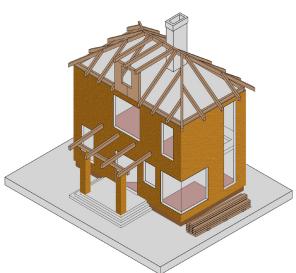
- Load calculation for rooftop helipads
- Load to be considered for parapets, balustrades, impacts and vibrations
- Imposed load due to fire tenders and emergency vehicles
- Maps on basic wind speed and seismic zones of India.



#### Section 2 Soil and Foundation

This Section covers geotechnical design of building foundations, such as:

- Geotechnical investigation and exploration guidance
- Geotechnical design (principles) of building foundations
- Foundation systems to ensure safety and serviceability without exceeding the permissible stresses of the materials of foundations and the bearing capacity of the supporting soil/rock
- Deep foundation including pile foundation
- Shallow foundation including raft foundation
- Ground improvement techniques.



#### Section 3 Timber and Bamboo

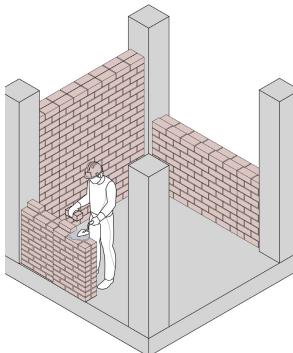
- 3A Timber- This Subsection covers the general principles involved in the design of structural timber in buildings, including elements of structures connected by fasteners/fastening techniques. It also covers the engineering properties of various species of timber.
- 3B Bamboo- This Subsection covers the design of structural bamboo in buildings with regard to mechanical resistance and durability of structures. It also covers the engineering properties of various species of bamboo.



For more details on Part 6, please refer to NBC 2016



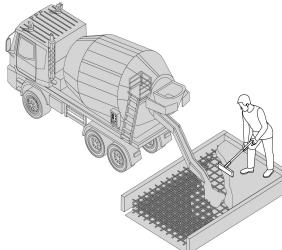
## Section 4 Masonry



This Section covers the structural design of unreinforced and reinforced masonry elements in buildings. This Section also covers:

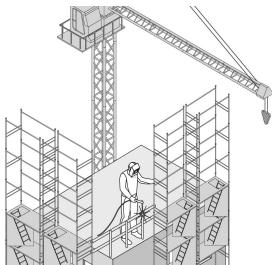
- Materials
- General requirements
- Structural design of load bearing buildings.
- Reinforced brick and reinforced brick concrete floors and Roofs
- Special consideration from earthquake point of view
- Guidelines for improving earthquake resistance of low strength masonry buildings
- Confined masonry
- Guidelines for design of non-load bearing walls/partitions
- Masonry walls using rat-trap bond technology.

## Section 5 Concrete



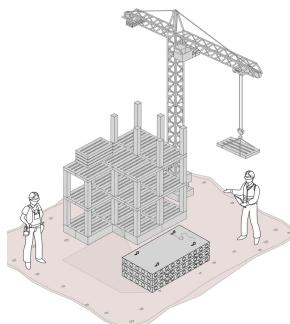
This Section covers structural designing of plain, reinforced concrete and prestressed concrete. The Section has been subdivided into the following Subsections:

- 5A Plain and Reinforced Concrete—This Subsection covers:
  - General structural use of plain and reinforced concrete
  - Requirements of durable concrete production, fire safety and protection from environment
  - Detailed design consideration for concrete strength upto M60
  - Reinforcement requirements and detailing aspects for all type of structural elements
  - Special concretes like self-compacting concrete, high performance concrete and steel fibre reinforced concrete.
- 5B Prestressed Concrete—This Subsection covers:
  - Structural design aspects of prestressed concrete.
  - Works carried out on site and the manufacture of precast prestressed concrete units
  - Updated provisions on end-zones, ultimate shear resistance, etc.



## Section 6 Steel

This Section covers the structural design aspects of steel structures in buildings. This Section applies to general construction using hot rolled steel sections and steel tubes joined using riveting, bolting and welding. This Section covers the design by limit state method and plastic theory, and also enables design by working stress method.



## Section 7 Prefabrication, Systems Building and Mixed/Composite Construction

The Section has been subdivided into the following Subsections:

- 7A Prefabricated Concrete– This Subsection gives:

- Recommendations regarding modular planning, component sizes, prefabrication systems
- Design considerations, joints & testing
- Manufacture, storage, transportation and erection
- Other related requirements for prefabricated concrete.

- 7B Systems Buildings and Mixed/Composite Construction–

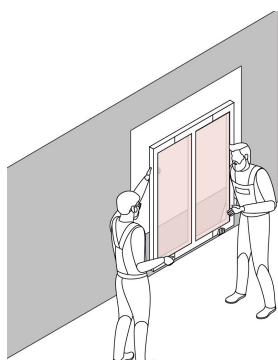
This Subsection covers:

- Recommendations regarding modular planning, component sizes
- Joints, manufacture, storage, transport and erection of prefabricated elements
- Other related requirements for systems building and mixed/composite construction.

## Section 8 Glass and Glazing

This Section covers:

- Selection and application of glass in buildings
- Types of glass, its requirements and associated glazing materials
- Glazing in buildings with respect to its effect on energy, visual (light) and solar environments
- Design of glass in buildings, subject to wind loading, seismic loading
- Selection, manifestation of glass in buildings, subject to safety with respect to human impact of the occupants
- Selection, design, fabrication, installation, testing and maintenance of glazing systems.



For more details on Part 6, please refer to NBC 2016



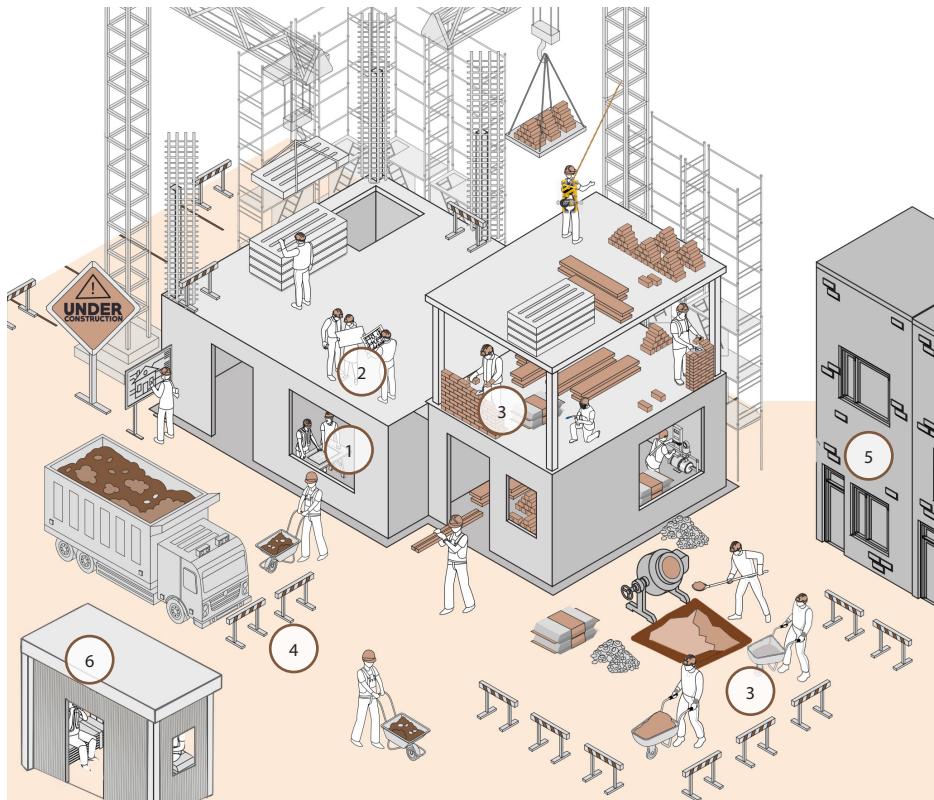


## Part 7 Construction Management, Practices and Safety

### Key Content

This Part covers construction project management, construction planning, site management and building construction practices, storage, stacking and handling of materials. It also deals with safety of personnel during construction operations, demolition of buildings, habitat and welfare requirements for workers. The guidelines relating to repairs, retrofitting and strengthening of buildings are covered under this Part.

### Part 7 at a glance



- 1) Construction management (time, cost, quality, health and safety)
- 2) Construction planning and site management
- 3) Construction practices
- 4) Safety in construction
- 5) Repairs, retrofitting and strengthening of buildings
- 6) Habitat and welfare requirements for workers

**Standards** relating to construction project management functions and construction practices are also referred in this Section.



For more details on Part 7, please refer to NBC 2016



## Part 8 Building Services

### Key Content

All buildings meant for human habitation must be provided with adequate building services. This Part prescribes requirements for building services, and is divided into 6 Sections.

Section 1 Lighting and Natural Ventilation

Section 2 Electrical and Allied Installations

Section 3 Air-conditioning, Heating and Mechanical Ventilation

Section 4 Acoustics, Sound Insulation and Noise Control

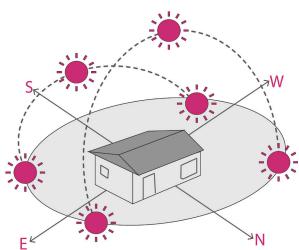
Section 5 Installation of Lifts, Escalators and Moving Walks

Section 6 Information and Communication Enabled Installation

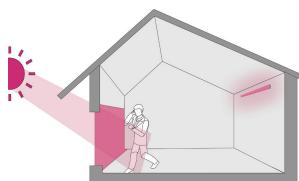
### Part 8 at a glance

#### Section 1 Lighting and Natural Ventilation

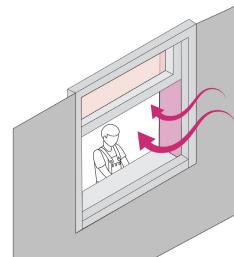
This Section covers requirements and methods for lighting and natural ventilation of buildings; design for both daylighting and artificial lighting. It also has provisions on energy conservation in lighting.



Orientation of building



Lighting



Ventilation

This Section also includes the following important aspects:

- Climatic classification map of India
- Table on solar radiation as per seasons for determining heat intake
- Recommended level of illuminance for different spaces/activities in different buildings (refer Table 4)
- Recommended values for air changes for different buildings/spaces
- Maximum allowable contaminant concentrations for fresh/ventilation air
- Optimum size/number of fans for rooms of different sizes.



## **Section 2 Electrical and Allied Installations**

This Section covers the essential requirements for electrical installations in buildings to ensure efficient use of electricity including safety from fire and shock. It also includes general requirements relating to lightning protection of buildings and provisions on certain allied installations.

Planning of electrical installations include planning spaces for substation, switch rooms, emergency power back up system, distribution panels, overhead lines, wires and cables.

The electric and allied installations are to be carried out in conformity with the requirements of the Electricity Act, 2003 and the Central Electrical Authority (measures relating to safety and electric supply) regulations, 2010, as amended from time to time.

Key aspects covered under the Section are as follows:



Planning of electric installation



Distribution of supply and cabling



Wiring (including selection of size of conductors)



Fittings and accessories



Earthing (including maintenance free earthing)



Inspection, testing and verification of installation



Allied/misellaneous services



Lightning protection of buildings



Electrical installation for construction and demolition sites



Protection of human beings from electrical hazards

This Section also includes provisions on:

- Location of energy meters, centralized metering system and smart metering
- Requirements for electrical supply system for life and safety services
- Discrimination, cascading and limitation concepts for the coordination of protective devices in electrical circuits
- Solar photovoltaic system
- Aviation obstacle lights
- Electrical supply for electric vehicle charging and car park management system
- Typical formats for checklists for handing over and commissioning of substation equipment and earthing pit.

## **Section 3 Air conditioning, Heating and Mechanical Ventilation**

This Section covers planning, selection, design considerations, installation, testing and commissioning of air conditioning, heating and mechanical ventilation systems for buildings. Planning includes equipment room for central AC plant, air handling units and package units, pipe shafts, supply/return air ducts and cooling tower.

Key aspects covered in the Section are as follows:



Refrigerants



Planning



Outdoor and  
indoor design  
conditions



Design of air  
conditioning



Specialized  
application



Refrigeration  
for cold stores



Heating



Mechanical  
ventilation



Installation of  
HVAC system



Symbols, units,  
colour code and  
identification of  
services



Building automation  
system for HVAC  
control, monitoring  
and verification



Testing,  
commissioning  
and performance  
validation

This Section also includes provisions on:

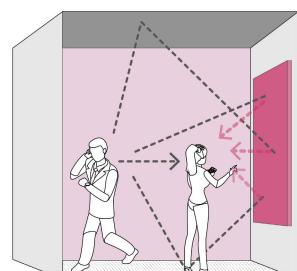
- Design of indoor conditions as per adaptive thermal comfort model
- Minimum ventilation rates in breathing zone
- Energy efficient air conditioning systems such as variable refrigerant flow system, inverter technology, district cooling system, hybrid central plant using chilled beams and radiant floor components
- Envelope utilization using energy modelling, day light simulation, solar shade analysis and wind modelling software
- Weather data of 60 cities of India
- Direct/indirect evaporative cooling units and geo-thermal cooling and heating
- HVAC systems for healthcare facilities, data centres and underground metro stations
- Energy efficient strategies for winter heating, using reverse cycle operation, solar heating systems, electric heat pump and ground source heat pump
- Modern system of mechanical ventilation for industries, commercial kitchens, underground parking and for open tunnel connecting underground metro stations
- Demand control ventilation and axial flow fans with aerofoil profile blades.

#### Section 4 Acoustics, Sound Insulation and Noise Control

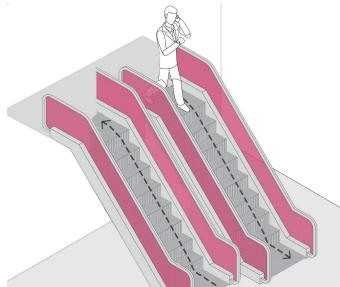
This Section covers requirements and guidelines with regards to planning against outdoor and indoor noise, acceptable noise levels and sound insulation in buildings with different occupancies, such as residential, educational, hospital, industrial, office buildings, hotels, hostels, laboratories, test houses and other miscellaneous buildings.

This Section also includes the following aspects:

- Design techniques for noise control of building services
- Guide for noise calculation, specifications for sound insulation and noise rating
- Examples of special problems requiring expert advice.



## Section 5 Installation of Lifts, Escalator and Moving Walks



This Section covers requirements for planning, design, installation, operation, maintenance and inspection of lifts (passenger, goods, hospital, service, dumb waiter lifts), escalators and moving walks so as to ensure safe movement of people with satisfactory performance. This Section has been subdivided into two Subsections namely, 5A Lifts and 5B Escalators and Moving Walks.

The two Subsections include the following:

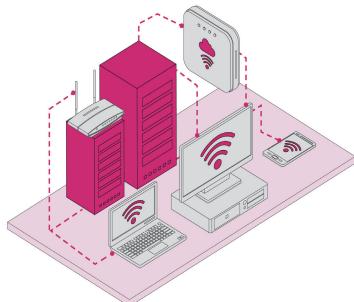
- Design arrangements and planning
- Civil and electrical requirements
- Fire protection requirements
- Minimum technical and safety requirements
- Performance requirements
- Inspection and maintenance
- Typical checklists for inspection.

Additional requirements specific to lifts include the following:

- Planning of lifts for specific building features (such as special building facilities, basement service, multiple entry levels, non smoking buildings, reserve lifts and zoning/sky lobbies in very tall buildings) and for different building types
- Specific requirements for lifts in high rise buildings and evacuation lifts
- Technical requirements for lifts in super high rise buildings
- Special lifts such as lifts without conventional machine rooms (MRL lifts), lifts used in private apartments (home lifts), hydraulic lifts, lifts with seismic resistance features.

The installation of lifts are carried out in conformity with Lift Acts and Rules, as amended from time to time.

## Section 6 Information and Communication Enabled Installations



This Section covers the essential requirements for information and communication enabled installations, technology systems and cabling installations in a building. It also covers the basic design and integration requirements for telecommunication spaces within building(s) along with their cabling infrastructure, their pathway components and passive connectivity hardware.



For more details on Part 8, please refer to NBC 2016



## Part 9 Plumbing Services (including Solid Waste Management)

### Key Content

This Part has 4 Sections; for water supply, drainage and sanitation, solid waste management and gas supply. All buildings meant for human habitation shall be provided with potable water supply and adequate sanitary facilities.

#### Section 1 Water Supply

#### Section 2 Drainage and sanitation

#### Section 3 Solid Waste Management

#### Section 4 Gas Supply

Based on local Authority's Occupancy Permit for a building, connection from the Water Supply Board and Drainage Board are obtained.

### Part 9 at a glance

#### Section 1 Water Supply

This Section covers basic water supply requirements for different building occupancies along with provisions of plumbing, design, inspection and maintenance of water supply systems. It also includes provisions of water supply systems in high altitude and/or sub-zero temperature regions. Water supply requirements for firefighting, street cleaning and industrial plants are not included in this Section.



Basic principles for designing water supply system



Water supply requirements for different building types



Water sources and quality



Estimate of demand load



Storage of water



Protection of water supply



Materials, fittings and appliances



Design of distribution system



Distribution systems in multi-storeyed buildings



General requirements for pipe work



Jointing of pipes



Backflow prevention



Conveyance and distribution of water within premises



Laying of mains and pipes on site



Hot water supply installations



Inspection and testing



Cleaning and disinfection of supply system



Water supply system in high altitudes and/or sub-zero temperature



Guidelines to maintenance



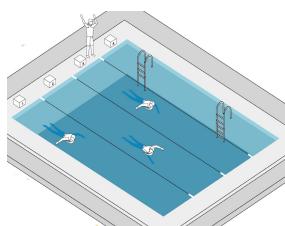
Requirement for Swimming pools



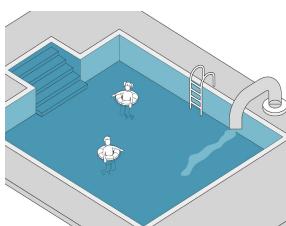
Allowance for expansion

## Swimming Pools

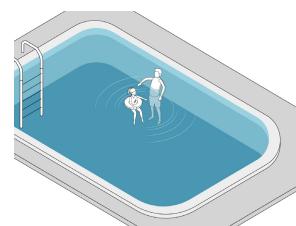
Swimming pools covered in National Building Code of India (NBC 2016) are of 3 types.



Recirculation



Flow Through



Fill and Draw

The Recirculation System is based on the nature of usage such as private, public, wading and competition pools. This system is provided to minimize water wastage. Disinfection shall be invariably done to ensure water of potable quality.

Flow Through type of pools require more water for replenishment and so cautious decision of usage of such pools should be made to ensure clear water of potable quality.

Fill and Draw type of pool is not recommended considering water conservation. Clear water of potable quality is retained till it becomes turbid or unfit for use. Thereafter, the pool is drained, cleaned and refilled with clear water.

## Section 2 Drainage and Sanitation

This Section covers drainage and sanitation requirements for buildings including design, layout, construction, maintenance and connection up to point of disposal such as public sewer, private sewer, individual sewerage disposal system, cesspool or any other approved point of disposal/ treatment. It also includes requirements of drainage system for high altitude and sub-zero temperature regions.

Tables 1– 15 cover drainage and sanitation requirements for different types of buildings.



Basic principles of drainage and sanitation



Drainage and sanitation requirements for different building occupancies



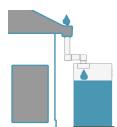
Materials, fittings and accessories



Planning and design considerations



Consideration relating to conveyance of sanitary wastes



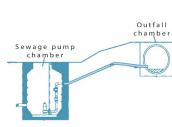
Construction relating to conveyance of rain and storm water



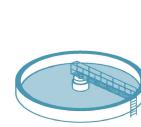
Inspection and testing



Maintenance

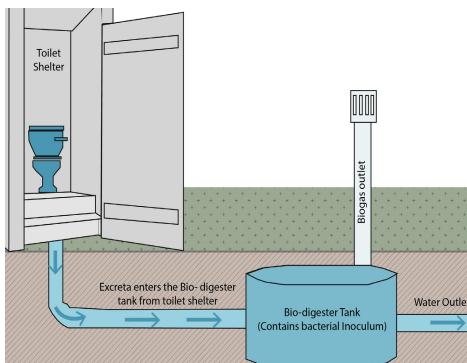


Pumping of sewage



Sewage treatment system

### Bio-toilet (or Eco-toilet)



Bio-toilet involves sludge free disposal of human waste. It decomposes solid waste into water and bio-gas. It is eco-friendly, hazard free, requiring least maintenance and is capable of functioning efficiently at sub-zero temperatures.

Bio-toilet is mainly a prefabricated type structure, above the ground with a bio-digester tank below the ground.

It is useful in situations where sewerage system is not available.

## Section 3 Solid Waste Management

This Section comprehensively covers solid waste management system for buildings including assessment of waste generation and its treatment. Additionally, other rules and regulations in force shall be complied with for treatment and handling of solid waste. These rules and regulations are also briefly covered in this Section.



Classification of solid waste based on sources of generation, characteristics, etc.



Considerations and requirements for designing a municipal solid waste management system



Refuse chute system



Assessment of per capita waste quantities for different type of solid wastes



Methods of treatment and disposal

## Section 4 Gas Supply

This Section prescribes safety requirements of persons and property for all piping uses and for all types of gases; for usages like fuel, lighting and medical purposes.



Requirements for safe installation of LPG, PNG and medical gas



Requirements for pressure



Rules for turning gas on



Rules for shutting gas off



Installation of gas pipes



Inspection of services



Leakage check



For more details on Part 9, please refer to NBC 2016





## Part 10 Landscape Development, Signs and Outdoor Display Structures

### Key Content

This Part covers provisions related to landscape planning, design and development and the requirements of signs and outdoor display structures with regard to public safety, structural safety and fire safety. It is divided into following two Sections:



Section 1 Landscape Planning,  
Design and Development



Section 2 Signs and  
Outdoor Display Structures

### Part 10 at a glance

#### Section 1 Landscape Planning, Design and Development

This Section covers requirements of landscape planning, design and development with the view to promoting quality of outdoor built and natural environments and the protection of land and its resources.



Statutory Approvals



Landscape Site Planning  
Requirements



General Landscape  
Development Guidelines

Details of documents required for statutory approval of landscape development such as Landscape Master Plan, Irrigation Plan, Planting Plan, Grading Plan, etc.

Assessment of the landscape requirements for the site including location, site factors, brief, user groups and landscape development for special conditions.

Design aspects such as structural stability, waterproofing, drainage, soil fill and location of planting for landscaping roof.

## Components of Landscape Planning, Design and Development

### 1. Planting Design

Aspects of planting such as ecology, botany, horticulture, aesthetic value, growth and survival patterns which would enable integrated landscape designing.

### 2. Service/Utilities in Landscape Development

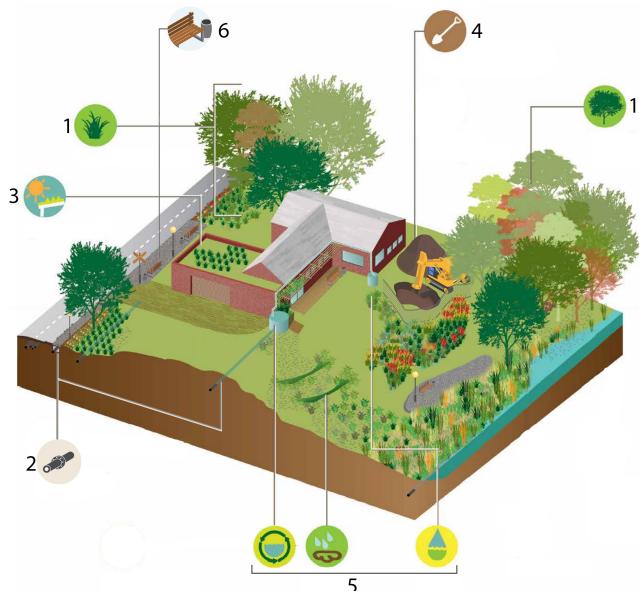
Design integration of structures and elements related to external services (underground and overground utilities).

### 3. Design Guidelines for Roof Landscape

Aspects such as structural stability, waterproofing, drainage, soil fill and location of planting for landscaping roof.

### 4. Protection of Landscape during construction

Measures to put in place for minimum disturbance to existing soil conditions and overall micro-climatic pattern during development.



### 5. Soil & Water Conservation

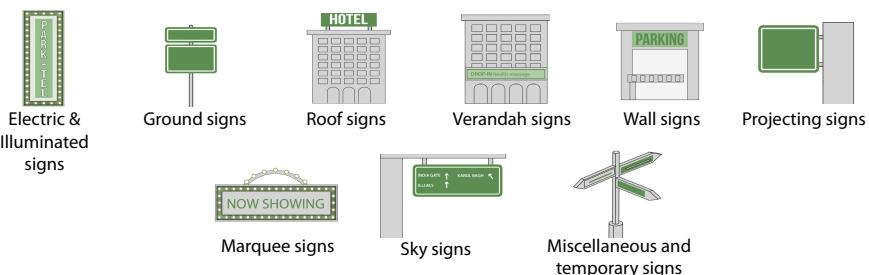
Post construction practices to be followed with respect to vegetative measures, stormwater management, filtration techniques and conservation & reuse of water for irrigation.

### 6. Street Furniture

Elements for outdoor spaces such as pavement-pedestrian movement spaces, parking and vehicular movement corridor, traffic management units, public conveniences, shelter and kiosks, illumination, etc.

## Section 2 Signs and Outdoor Display Structures

This Section covers the requirements of all signages and outdoor display structures for public safety, structural safety and fire safety.



The signage requirements for Accessibility in Public Buildings and Public Spaces and, Fire safety are covered in Part 3 and Part 4 respectively of NBC 2016.



For more details on Part 10, please refer to NBC 2016





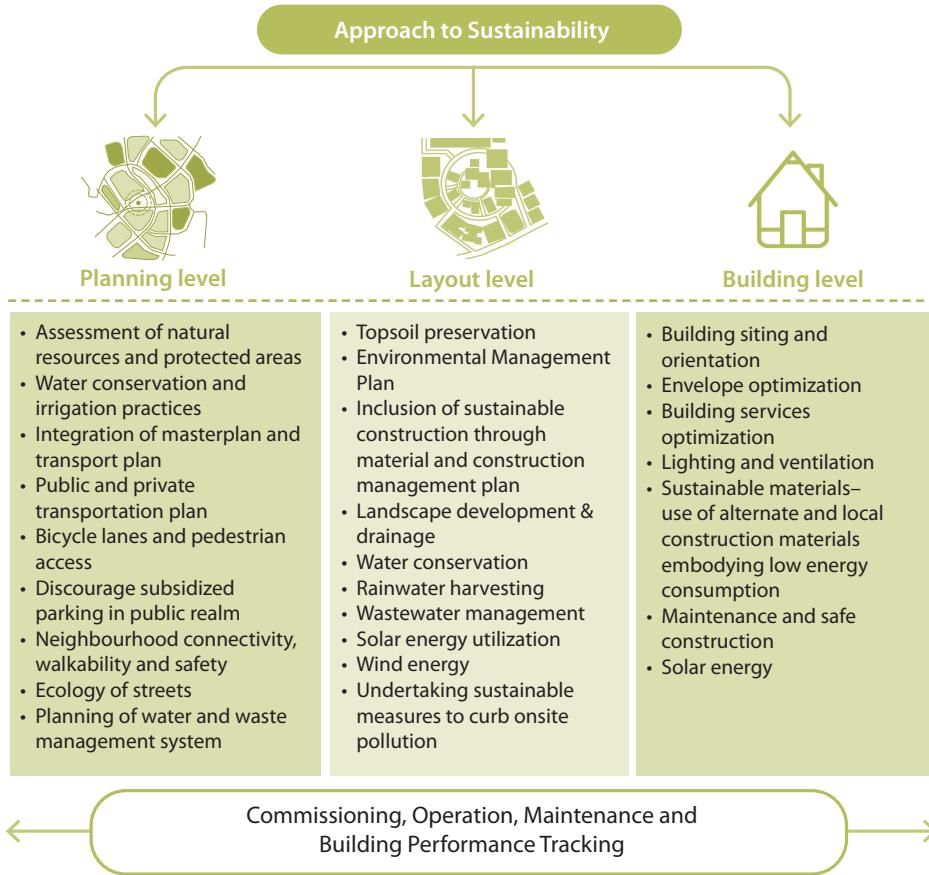
## Part 11 Approach to Sustainability

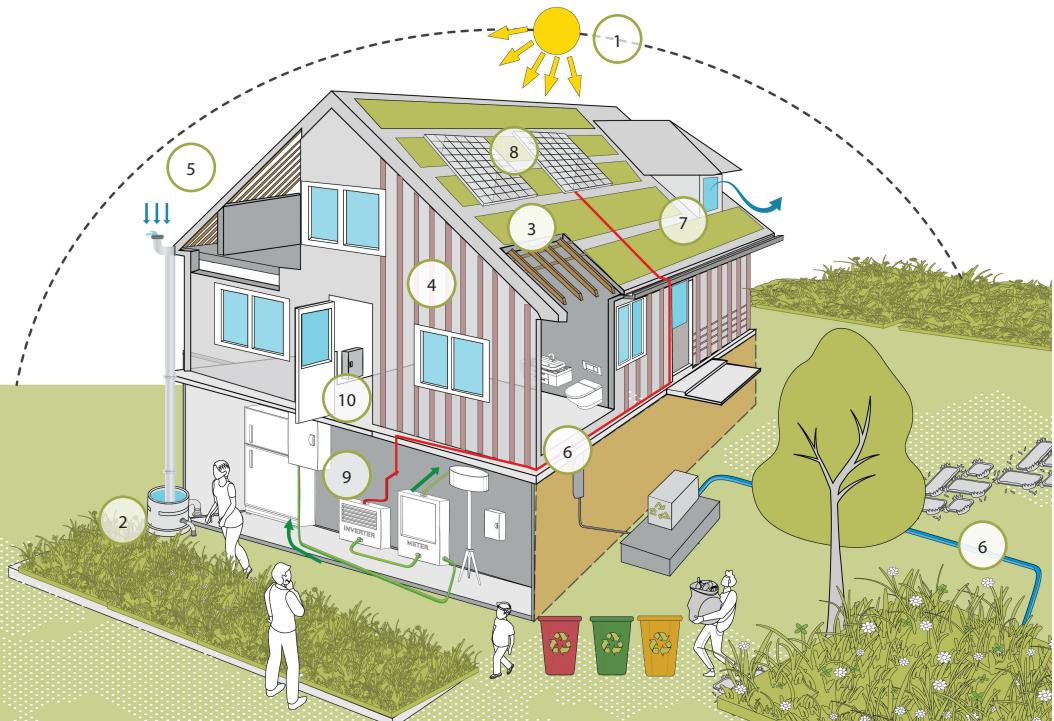
### Key Content

This Part covers the parameters required for planning, design, construction, operation and maintenance of buildings and those relating to land development from the point of view of sustainability.

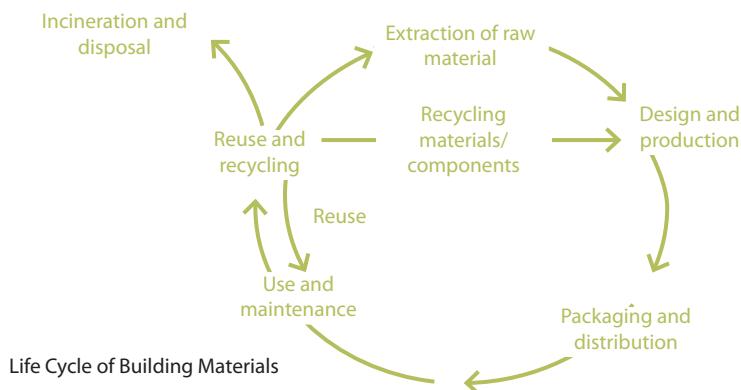
Approach to Sustainability	Siting, Form and Design	External Development and Landscape	Materials
Waste Water Management	Building Services Optimization	Construction Practices	Commissioning, Operation, Maintenance and Building Performance Tracking

### Part 11 at a glance





- 1) Siting, form and design—building oriented optimally based on sun-path analysis  
 2) External development and landscape—use of vegetation that promotes a regional identity and a sense of place
- 3) Enhancement on thermal performance of envelope  
 4) Sustainable building materials  
 5) Rainwater harvesting  
 6) Waste water recycling
- 7) Natural ventilation strategies  
 8) Passive cooling/heating techniques  
 9) Energy efficient electrical system  
 10) Building performance tracking system



For more details on Part 11, please refer to NBC 2016





## Part 12 Asset and Facility Management

### Key Content

This Part covers provisions relating to management of building assets and associated facilities, such as building and building services. It also covers responsibility of facility managers and of occupants for maintenance of facilities, such as structures, equipment and exterior property.

Asset/Facility Management

Building Maintenance – Methods and Management

Building Fabric Maintenance

Systems Maintenance

Services Maintenance

### Part 12 at a glance

Asset management is integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities.

The organizational strategic plan is the starting point for development of the asset/facility management policy, strategy, objectives and plans.

Guiding factors for organizational setup  
of Asset/Facility Management System



Scope of Work



Competence of Staff at Various Levels



Organization Roles at Various Levels

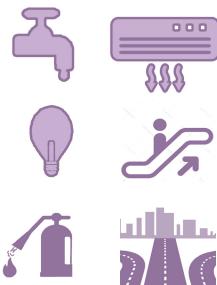


Facility Manager



Outsourcing

Asset/Facility management can be classified under 2 services



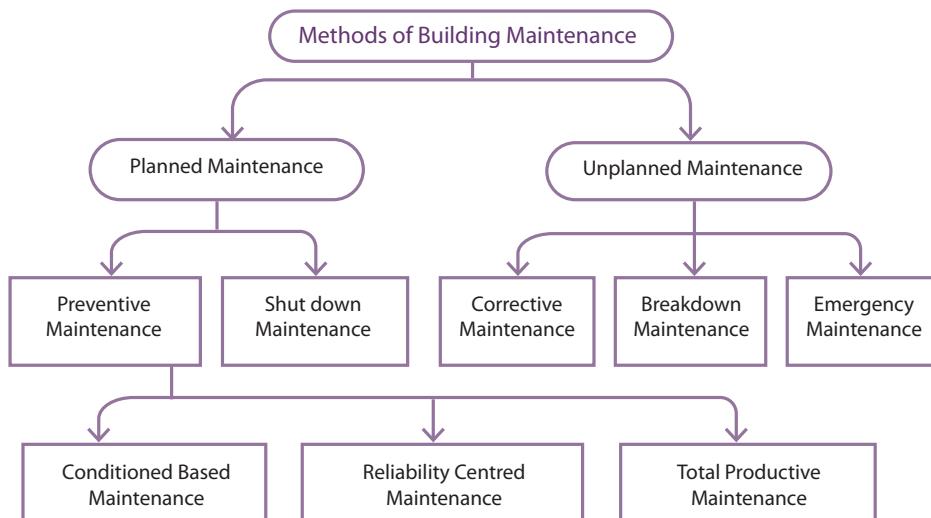
### Hard Services

- Building fabric maintenance
- Building services maintenance that includes
  - Plumbing and drainage
  - Air conditioning
  - HVAC services
  - Electrical installations
  - Lifts and escalators
  - Fire fighting—detection and suppression
  - Roads and pathways.



### Soft Services

- Landscaping and horticulture waste management
- Housekeeping
- Pest control
- Security management
- Solid waste management.



For more details on Part 12, please refer to NBC 2016



## Notes

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