



## Latest Developments in Indian Standards in Civil Engineering & NBC 2016

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# **PILLARS OF PROGRESS**

- 1) Land Development**
- 2) Building Construction**

# NEED FOR BUILDING REGULATION AND CONSTITUTIONAL POSITION

Subjects relating to land and buildings fall under the State List  
(**Seventh Schedule** )

35. Works, lands and buildings vested in or in the possession of the State.

49. Taxes on lands and buildings.

**Schedule** (referred to under Article 243W) added by the Constitution (74th Amendment) Act, 1992 (w.e.f 01.06.1993),

1. **Urban planning** including town planning.
2. **Regulation of land-use and construction of buildings.**
3. Planning for **economic and social development.**
4. **Roads and bridges.**
5. **Water supply** for domestic, industrial and commercial purposes.
6. **Public health**, sanitation conservancy and solid waste management.
7. **Fire services.**

## NEED FOR BUILDING REGULATION AND CONSTITUTIONAL POSITION

8. Urban forestry, protection of the environment and promotion of ecological aspects.
9. Safeguarding the interests of weaker sections of society, including the handicapped and mentally retarded.
10. **Slum improvement** and upgradation.
11. Urban poverty alleviation.
12. Provision of urban amenities and facilities such as parks, gardens, playgrounds.
13. Promotion of cultural, educational and aesthetic aspects.
14. Burials and **burial grounds**; cremations, **cremation grounds**; and **electric crematoriums**.
15. Cattle ponds; prevention of cruelty to animals.
16. Vital statistics including registration of births and deaths.
17. **Public amenities** including street lighting, parking lots, bus stops and public conveniences.
18. Regulation of slaughter houses and tanneries.

# **AUTHORITIES HAVING JURISDICTION**

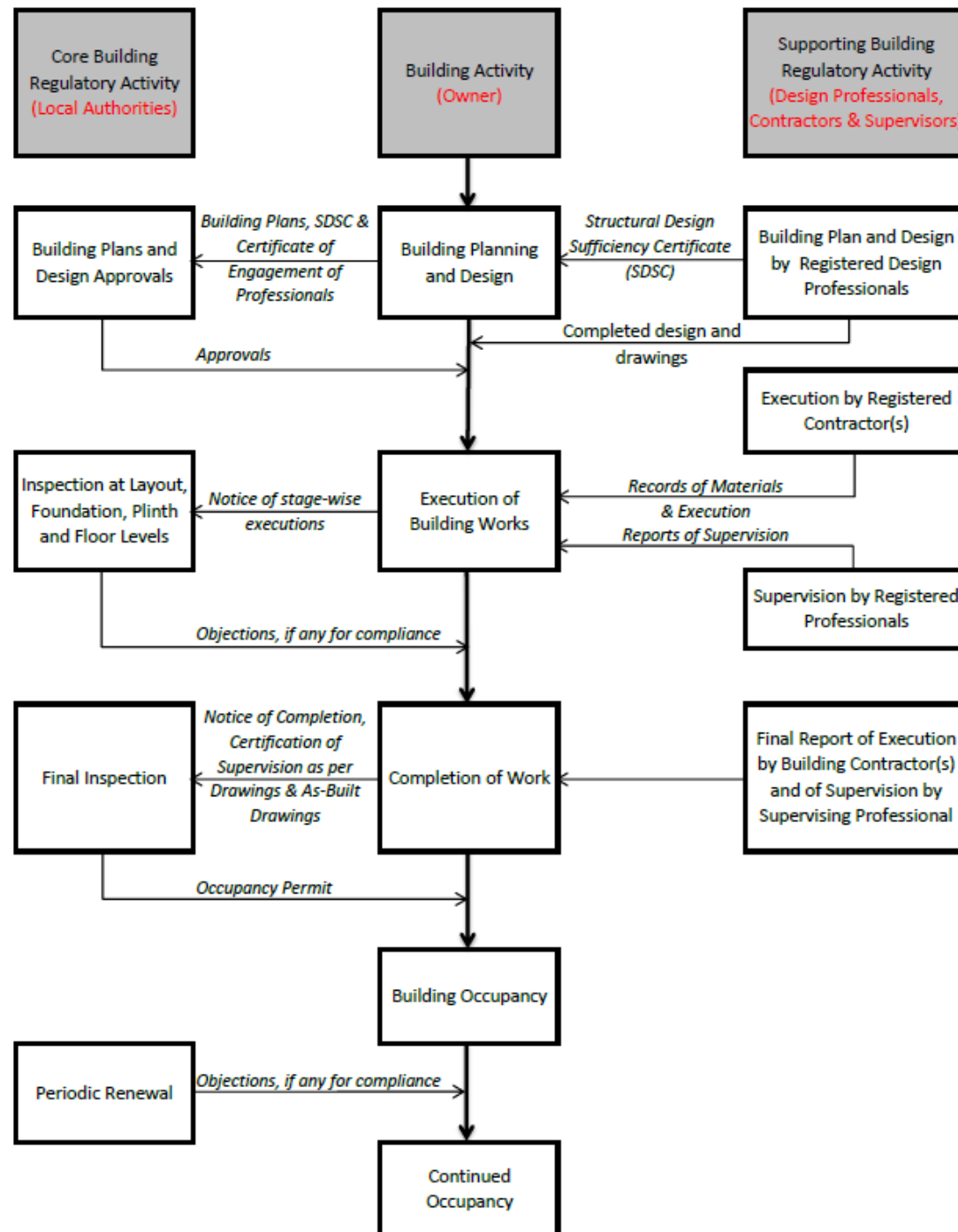
- 1) Municipal Corporation
- 2) Municipality
- 3) Notified Area Committee
- 4) Town Area Committee
- 5) Cantonment Board
- 6) Township
- 7) Port Trust
- 8) Special Purpose Agency like:
  - Town improvement trusts.
  - Urban development authorities.
  - Water supply and sewerage boards.
  - Housing boards.
  - Pollution control boards.
  - Electricity supply boards.
  - City transport boards.

# INSTRUMENTS FOR BUILDING REGULATION

- Town and Country Planning Act/  
Development Act
- Master Plan, Zonal Plans and Layout Plans
- Municipality/Municipal Corporation Act
- Building Bye-Laws

# AUTHORITIES FOR ADDITIONAL CLEARANCES THAT MAY BE REQUIRED

AUTHORITIES	ADDITIONAL CLEARANCES
<b>Fire Authorities</b>	High rise and special (fire vulnerable) buildings
<b>Chief Inspectorate of Factories</b>	Industrial buildings
<b>Pollution Control Board</b>	As per respective state norms
<b>Chief Controller of Explosives, Nagpur</b>	Hazardous buildings
<b>Urban Art Commission</b>	As per relevant Acts
<b>Archaeological Survey of India</b>	Plot falling within 300 m distance from any protected monument
<b>Railway/Metro-rail Authority</b>	Plot is falling within railway corridor
<b>Airports Authority of India</b>	Plot is falling in proximity of airport; etc





## Break-up of Standards in Civil Engineering into Different Aspects

1) Product Standards	<b>744</b> (42%)
2) Codes of Practice	<b>449</b> (25.5%)
3) Methods of Tests	<b>334</b> (19%)
4) Terminology	<b>45</b> (2.5%)
5) Dimensions	<b>11</b> (0.5%)
6) Safety Standards	<b>35</b> (2%)
7) Others	<b>150</b> (11%)
<b>TOTAL</b>	<b>1,768</b> (100%)

- Product Standards** – Are Specifications amenable to BIS' Standard mark (ISI mark)
- Methods of Tests** – Give Procedure for testing Products for conformity to Product Standards
- Codes of Practice** – Give good practices for various works
- Terminology** – Give glossary of terms along with definitions used
- Dimensions** – Give dimensional requirements of products if not covered in Product standards
- Safety Standards** – Give safety in manufacture, use of products and in works
- Others** – Include Special Publications (SPs)/ Handbooks

CIVIL ENGINEERING DIVISION COUNCIL  
CEDC

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graph TD; CEDC[CIVIL ENGINEERING DIVISION COUNCIL  
CEDC] --> SC[36 SECTIONAL  
COMMITTEES]; SC --> SSC[33 SUBCOMMITTEES]; SSC --> P[62 PANELS];
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36 SECTIONAL  
COMMITTEES

33 SUBCOMMITTEES

62 PANELS

Total number of Members involved = 3,210

**Total number of Standards formulated = 1,768**

# Committees Responsible for Formulation of Indian Standards, at a Glance

<b>Technical Committees</b>	<b>Number</b>	<b>No. of Members</b>
<b>Civil Engineering Division Council, CEDC</b>	<b>1</b>	<b>69</b>
<b>Sectional Committees</b>	<b>36</b>	<b>1,378</b>
<b>Subcommittees</b>	<b>33</b>	<b>810</b>
<b>Panels</b>	<b>62</b>	<b>1,007</b>
<b>Working Groups</b>	<b>134</b>	

# Sectional Committees Under CEDC

<b>Committee No.</b>	<b>Title of the Committee</b>
CED 02	Cement and concrete sectional committee
CED 03	Sanitary appliances and water fittings sectional committee
CED 04	Building limes and gypsum products sectional committee
CED 05	Flooring, wall finishing and roofing sectional committee
CED 06	Stones sectional committee
CED 07	Structural engineering and structural sections sectional committee
CED 09	Timber and timber stores sectional committee
CED 11	Doors, windows and shutter sectional committee
CED 12	Functional requirements in buildings sectional committee
CED 13	Building construction practices sectional committee
CED 15	Builder's hardware sectional committee
CED 20	Wood and other lignocellulosic products sectional committee

(contd...)

# Sectional Committees Under CEDC

Committee No.	Title of the Committee
CED 22	Fire fighting sectional committee
CED 24	Public health engineering sectional committee
CED 29	Construction management (including safety in construction) sectional committee
CED 30	Clay and stabilized soil products for construction sectional committee
CED 35	Furniture sectional committee
CED 36	Fire safety sectional committee
CED 37	Structural safety sectional committee
CED 38	Special structures sectional committee
CED 39	Earthquake engineering sectional committee
CED 41	Water proofing and damp-proofing sectional committee
CED 43	Soil and foundation engineering sectional committee
CED 44	Methods of measurement of works of civil engineering (excluding water resources development division) sectional committee

(contd...)

# Sectional Committees Under CEDC

Committee No.	Title of the Committee
CED 46	National building code sectional committee
CED 47	Ports, harbours and offshore installations sectional committee
CED 48	Rock mechanics sectional committee
CED 50	Plastic piping systems sectional committee
CED 51	Planning, housing and prefabricated construction sectional committee
CED 53	Cement matrix products sectional committee
CED 54	Concrete reinforcement sectional committee
CED 55	Sieves, sieving and other sizing methods sectional committee
CED 56	Hill area development engineering sectional committee
CED 57	Cyclone resistant structures sectional committee
CED 58	Sustainability of built environment sectional committee
CED 59	Smart cities sectional committee

# Standards at a Glance

Committee No.	Product Specification (S)	Codes of Practice (C)	Methods of Tests (M)	Terminology (T)	Others (O)	Total
CED 02	56	20	60	14	3	<b>153</b>
CED 03	68	1	2	0	0	<b>71</b>
CED 04	20	13	14	2	0	<b>49</b>
CED 05	27	21	23	2	3	<b>76</b>
CED 06	9	2	16	1	13	<b>41</b>
CED 07	20	18	0	0	23	<b>61</b>
CED 09	82	17	25	2	10	<b>136</b>
CED 11	22	2	1	1	1	<b>27</b>
CED 12	1	17	3	1	2	<b>24</b>
CED 13	10	67	6	3	16	<b>102</b>
CED 15	42	0	0	0	0	<b>42</b>
CED 20	47	7	16	0	0	<b>70</b>
CED 22	87	18	1	1	30	<b>137</b>
CED 24	24	34	1	1	1	<b>61</b>
CED 29	0	18	0	0	20	<b>38</b>
CED 30	20	5	6	2	1	<b>34</b>
CED 35	45	2	13	1	2	<b>63</b>
CED 36	4	28	11	1	4	<b>48</b>

(contd...)

# Standards at a Glance

Committee No.	Product Specification (S)	Codes of Practice (C)	Methods of Tests (M)	Terminology (T)	Others (O)	Total
CED 37	0	5	0	0	1	6
CED 38	0	9	0	0	2	11
CED 39	0	14	0	0	0	14
CED 41	12	9	11	1	3	36
CED 43	18	38	66	2	2	126
CED 44	0	0	0	0	29	29
CED 46	0	0	0	0	1	1
CED 47	0	9	0	1	1	11
CED 48	0	15	27	1	7	50
CED 50	57	4	2	0	3	66
CED 51	8	35	0	3	0	46
CED 53	43	8	23	1	16	91
CED 54	14	1	2	0	0	17
CED 55	8	1	5	4	0	18
CED 56	0	9	0	0	0	9
CED 57	0	2	0	0	0	2
CED 58	0	0	0	0	1	1
CED 59	0	0	0	0	1	1



# To know more about Technical Committees and their Standards and Work Programme, Visit:

<https://bis.gov.in/index.php/standards/technical-department/civil-engineering/>

The screenshot shows the Bureau of Indian Standards (BIS) website. The browser address bar displays [bis.gov.in/index.php/standards/technical-department/civil-engineering/](https://bis.gov.in/index.php/standards/technical-department/civil-engineering/). The website header includes the BIS logo and navigation menus for Standardization, Conformity Assessment, For Consumers, Laboratory Services, Hallmarking, Training, and About BIS. A secondary navigation bar shows a breadcrumb trail: Home > Standards Overview > Technical Department > Civil Engineering.

The main content area is titled "Civil Engineering" and features a large image of a hand pointing to architectural blueprints. Below the image, a text block describes the scope of standardization in civil engineering, including Structural Engineering, Building Materials and Components, Planning, Design Construction and Maintenance of Civil Engineering structures and Built Environment, Construction Practices, Safety In Building; But excluding those subjects which specifically relate to water resources Development and Management.

On the left side, a vertical menu lists various sections: Overview, Proposal For New Standards, Draft Standards Open for Comments, Become a Member, Published Standards, Harmonization of Standards, MoU with IIT's, Standards Under Development, Special Publications, Copyright, and Standards Formulation.

At the bottom, there are four featured cards: "Our Team" (Each Technical Department member brings in expertise from their respective field), "Composition of Committees" (It contains the composition of various panels, committees, sub-committees), "Programme of Work" (The Programme of Work is prepared to indicate the latest position of published standards), and "Drafts Under Wide Circulation" (Draft Indian Standards). A "Leave a message" button is located at the bottom right.

# Major Product Categories (with No. of BIS Licences)

Sl No.	Product Category	No. of Licences ~
1)	Plastic pipes & fittings	2,200
2)	Wood products	2,100
3)	Flooring tiles, paver blocks, tile adhesives, etc	1,700
4)	Cement, cement & concrete additives/admixtures, testing equipment	1,250
5)	Precast concrete products (pipes, blocks, roofing sheets, manhole covers & frames)	1,000
6)	Water fittings, sanitary appliances, water tanks	700
7)	Reinforcing & prestressing steel	670
8)	Fire fighting equipment	380
9)	Helmets (2-wheeler riders, police, industrial safety, visor)	280
10)	Builders hardware	170
11)	Structural steel products	50
12)	Lime & gypsum products	50
13)	Waterproofing, sealing & jointing products	30
	<b>Total (for 200 products)</b>	<b>~11,300 (31% of BIS licences)</b>

**NATIONAL BUILDING CODE  
OF INDIA 2016  
&  
INDIAN STANDARDS IN CIVIL  
ENGINEERING**

# HISTORICAL

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Year	History
1965	<b>Panel of Experts appointed by Planning Commission</b> to study the whole gamut of operations involved in construction such as: Administrative, Organizational, Financial, Technical
1968	'Report on Economies in Construction Costs' <b>recommended</b> : <ul style="list-style-type: none"><li>• One of the important steps towards achieving economy is through <b>formulation of Unified Building Code at national level.</b></li><li>• For this <b>NBC to be brought out</b> unifying building regulations throughout the country</li><li>• Job entrusted to the then ISI (now BIS)</li></ul>
1970	<b>NBC (first version)</b>
1983	<b>NBC (first revision)</b>
1987	Amendment No. 1 & 2 to NBC 1983
1997	Amendment No. 3 to NBC 1983
2005	<b>NBC (second revision)</b>
2015	Amendment No. 1 & 2 to NBC 2005
2016	<b>NBC (third revision)</b>

# CONTENTS OF NBC 2016

Part No.	Title
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
Part 7	Constructional Management, Practices and Safety
Part 8	Building Services
Part 9	Plumbing Services (including Solid Waste Management)
Part 10	Landscape Development, Signs and Outdoor Display Structures
Part 11	Approach to Sustainability
Part 12	Asset and Facility Management

# TEAM APPROACH

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Sl. No	Major Stages	Corresponding Team	Purpose
1.	Location/siting	Design team	Proper integration of various design inputs
	Conceptualization & planning		
	Designing and detailing		
2.	Construction/execution	Project Management & Construction Management Teams	Accomplishment in accordance with designs and specifications in a stipulated time and cost framework.
3.	Maintenance and repair	Operation & Maintenance Team or Asset Management Team or Estate Management Team	Operation, maintenance and repairs to be executed with least inconvenience and without any mismatch/damage to structure, finishings, fittings, etc.

# MULTI DISCIPLINARY TEAM OF BUILDING PROFESSIONALS

Each team to be multi-disciplinary team of need based professionals, depending upon type, size, magnitude, complexity in the project; such as:

Architect
Civil Engineer
Structural Engineer
<b>Geotechnical Engineer</b>
Electrical Engineer
Plumbing Engineer
Fire Protection Engineer
HVAC Engineer
<b>Lift, Escalator &amp; Moving Walk Specialist</b>
<b>Acoustics Specialist</b>
<b>Information/Communication Technology Engineer</b>
<b>Health, Safety &amp; Environment Specialist</b>

Environment/ <b>Sustainability Specialist</b>
Town Planner
Urban Designer
Landscape Architect
Security System Specialist
Interior Designer
Quantity Surveyor
Project/Construction Manager
<b>Accessibility &amp; Universal Design specialist</b>
<b>Asset/Facility Manager</b>
Other subject specialists

# Major Modifications in **Part 0 - Integrated Approach**

- ▶ Updated provisions for **association of need based professionals and agencies** to ensure proper discharge of responsibilities for accomplishment of building project.
- ▶ Inclusion of professionals such as **geotechnical engineers, ICT engineer, sustainability specialist, accessibility specialist**, and other subject specialist(s).
- ▶ Further reinforcement of the various considerations to be taken care of by the design teams, project/construction management team, and operation and maintenance team, considering the present day requirements and expectations from buildings and built environment.



## Major Modifications in **Part 1 - Definitions**

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- ▶ Various **new terms added** in various Chapters during this revision of the Code are reflected in this Part.
- ▶ Many of the **existing definitions** have been modified based on internationally accepted definitions.

# STRUCTURED APPROACH FOR ENSURING COMPLIANCE TO PROVISIONS OF NBC 2016 IN THE CODE

## Stages in Building Permit Process

- 1. Submission of application by owner along with**
  - Building plan
  - Service plan
  - Specifications
  - **Structural design sufficiency certificate** by engineer/ structural engineer and owner
  - **Certificate of engagement of builder/constructor(s)**
  - **Certificate of supervision** by architect/engineer
- 2. Verification of building plans and specifications by the Authority with respect to building byelaws**

# STRUCTURED APPROACH FOR ENSURING COMPLIANCE TO PROVISIONS OF NBC 2016 IN THE CODE....

3. **Sanction by the Authority including approvals from statutory authorities**
  - **Two stage approval for vulnerable buildings**
4. **Construction activity**
5. **Step-wise inspection by local authority**
6. **Completion of construction activity**
7. **Notice of completion by owner along with**
  - **Certification for execution of work** as per structural safety requirements by engineer/ structural engineer
8. **Inspection by Authority**
9. **Issue of Occupancy Permit by Authority.**

# PART 2

## ADMINISTRATION

It covers the administrative aspects of the Code, such as applicability of the Code, organization of building department for enforcement of the Code, procedure for obtaining development and building permits, and responsibility of the owner and all professionals involved in the planning, design and construction of the building.

# PART 2

## ADMINISTRATION Contd...

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- ▶ Organization of Building Department for enforcement of the Code
- ▶ Qualifications & competence of registered professionals (Annex A)
- ▶ Responsibilities of owner and professionals involved
- ▶ **Twelve** Standard Forms
  - ❖ Form for **first application** to develop, erect, re-erect or to make alteration in any place in a building
  - ❖ Form for certificate for structural **design sufficiency**
  - ❖ Form for **engagement** of builder/constructor
  - ❖ Form for supervision
  - ❖ Form for **sanction or refusal** of development/building **permit**
  - ❖ Form for notice for **commencement**
  - ❖ Form for certificate for **sub-surface investigation**
  - ❖ Form for certificate for **completed structural design work** as per structural safety requirements
  - ❖ Form for certificate for **supervision** of execution of work
  - ❖ Form for certificate for completed work **by builder/constructor**
  - ❖ Form for **completion certificate**

## Major Modifications in **Part 2 Administration**

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- ▶ **Ease of doing business** through detailed and updated provision for streamlining the approval process in respect of different agencies in the form of an **integrated approval process through single window approach**, thereby avoiding separate clearances from various authorities.
- ▶ Updated provision on **computerization of approval process**.
- ▶ Reinforcement of the provisions on the **mechanism of ensuring certification of structural safety of buildings** by the competent professional and peer review of design of buildings.
- ▶ Fixation of **responsibility for geotechnical engineer and contractor**, where involved in a building construction project.

# PART 3

## DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS

This Part deals with the development control rules and general building requirements to ensure health and safety of the public.

## **PART 3**

### **DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS**

- Land use classification and uses permitted
- Cluster planning approach and provisions for housing
- Inclusion of detailed town planning norms for various amenities such as:
  - Educational facilities
  - Health care facilities
  - Socio-cultural facilities
  - Distribution services
  - Police, Civil Defence & Home Guards
  - Fire services
  - Telephone, telegraph, postal and banking facilities
  - Sports activity
  - Shopping
  - Religious
  - Electrical substation
  - Transport
  - Cremation/Burial Ground, etc



## PART 3

### DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS (contd...)

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- **Parking norms for metro & mega cities**
- **Special requirements for low income housing in urban areas**
- **Special requirements for rural habitat planning**
- **Special requirements for development planning in hilly areas**
- **Provision for buildings & facilities for persons with disabilities and the elderly**

## Major Modifications in Part 3 Development Control Rules and General Building Requirements

- ▶ Modification of land use classification.
- ▶ Modification of planning norms for various amenities provided in a city/town and also inclusion of provisions for new amenities.
- ▶ Barrier free built environment: Comprehensive updated provisions for **accessibility in buildings and built environment for persons with disabilities** and the elderly by adopting **universal design principles**.
- ▶ Provisions on new planning and development norms, such as, Transferable Development Rights (TDR) and Accommodation reservation (AR).
- ▶ Foreword of this part also refers to Transit Oriented Development (TOD).

## Major Modifications in

# Part 3 Development Control Rules and General Building Requirements

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- ▶ Updated requirements for fire tender movement keeping in view availability of more equipped fire tenders of higher capacity.
- ▶ Provisions for underground or multi-storeyed parking as also mechanized parking of vehicles.
- ▶ Updated provisions on basements keeping in view the latest developments.
- ▶ New provisions for solar energy utilization.
- ▶ Updation of special requirements for low income housing and for development planning in hilly areas.
- ▶ Incorporation of requirements for upcoming buildings on podium for ensuring fire and life safety in such buildings.

# PART 4

## FIRE AND LIFE SAFETY

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### Approach towards Fire and Life safety

- FIRE PREVENTION
- LIFE SAFETY
- FIRE PROTECTION

# BUILDING OCCUPANCY CLASSIFICATION

<b>Group A Residential</b>	Lodging or rooming houses (A-1) One or two family dwelling (A-2) Dormitories (A-3) Apartment houses (flats) (A-4) Hotels (A-5) & Starred hotels (A-6)
<b>Group B Educational</b>	Schools up to senior secondary level (B-1) Others/training institutions (B-2)
<b>Group C Institutional</b>	Hospitals and Sanatoria (C-1) Custodial institutions (C-2) Penal & mental institutions (C-3)
<b>Group D Assembly</b>	D-1 to D-6 D-7 Underground and elevated MRTS
<b>Group E Business</b>	E-1 to E-5 (offices, banks, labs, computer, telephone exchanges, broadcasting stations)
<b>Group F Mercantile</b>	F-1 to F-3 (shops, departmental stores, markets & underground shopping centres)
<b>Group G Industrial</b>	Low hazard (G-1) Moderate hazard (G-2) High hazard (G-3)
<b>Group H Storage</b>	
<b>Group J Hazardous</b>	

- **Building classification**
- **Fire zones – Zone no. 1, 2 & 3**
- **Types of construction – Type 1, 2, 3 & 4**  
(based on fire resistance rating of building elements)

Fire Zones	Occupancy Group	Type of Construction
No. 1	A, B, C, D, E-1 (small offices), F	1, 2, 3, or 4
No. 2	E-2 to E-5, G-1, G-2	1, 2 or 3
No. 3	G-3, Group H, J	1 or 2

- **Surface interior finishes - Classes 1, 2, 3 & 4**  
(based on flame spread)

# LIFE SAFETY

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- Exit requirements
- Occupant load
- Egress components
- Exit capacities and arrangement
- No. of exits
- Max. travel distance
- Doorways, corridors & passageways
- Staircases – pressurization
- Ramps
- Compartmentation
- Smoke control
- Illumination/escape lighting
- Fire detection & alarm system
- Fire fighting shaft

# FIRE PROTECTION

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- **Fire Fighting Installation**
  - Fire extinguisher
  - First aid hose reel
  - Wet riser
  - Down comers
  - Yard hydrant
  - Automatic sprinkler system
  - Manually operated electric fire alarm system
  - Automatic detection and alarm system
  - Underground static water storage tank
  - Terrace tank over respective tower terrace
  - Pump near underground tank
  - Pump at terrace tank level
  - Dry riser (for hilly areas or industrial areas)
- **Fire protection requirements for high rise buildings**
- **Fire drill & evacuation procedures**



# Major Modifications in Part 4 Fire and Life Safety

- ▶ The **scope of application** of provisions of this Part for different occupancies has been **clarified**.

## FIRE PREVENTION

- ▶ **Table 1** on fire resistance ratings of structural and non-structural elements has been **updated**.
- ▶ Detailed provisions on **fire separating walls**, **fire separating floors** and **fire partitions**
- ▶ Separate **comprehensive clause** on **electrical power supply distribution** for **fire and life safety systems**
- ▶ Detailed provisions on **air conditioning systems** towards **safety and smoke control integration**
- ▶ **Glass façade requirements** have been detailed towards fire protection and smoke exhaust aspects
- ▶ Comprehensive clause on **Fire Command Centre (FCC)**

# Major Modifications in Part 4 Fire and Life Safety

## LIFE SAFETY

- ▶ Components of means of egress - **exit access, exit** and **exit discharge**
- ▶ **Table on capacity factors** - modified based on the aspect of **width per person** approach used globally
- ▶ Requirement for **displaying the occupancy load** for assembly buildings and call centres.
- ▶ Well integrated provisions on **firefighting shaft** to access the floor on fire and also allows egress/evacuation of the occupants with simultaneous use of **refuge area**.
- ▶ Updated provisions on **compartmentation** with fire barrier and its passive fire safety requirements for respective occupancies.

# Major Modifications in Part 4 Fire and Life Safety

## FIRE PROTECTION

- ▶ Erstwhile **Table 23** on minimum requirements for fire fighting installations (now **Table 7**) comprehensively updated.
- ▶ Detailed provisions have been included on **fire water storage, fire pump room, sprinkler system and various alternative fire suppression systems.**
- ▶ Detailed provisions on the concept of **progressive evacuation** in case of hospital buildings.
- ▶ Provisions on **refuge area** have been updated including for **D-6** occupancy and introduced for **apartment buildings of height 60 m and above.**
- ▶ Provisions specific to **atrium, commercial kitchen and car parking facilities.**
- ▶ Provisions specific to **Metro Stations** and **Metro Trainways**

# CATEGORIES OF MATERIALS

- ALUMINIUM AND OTHER LIGHT METALS AND THEIR ALLOYS
- BITUMEN AND TAR PRODUCTS
- BUILDER'S HARDWARES
- BUILDING CHEMICALS
- BUILDING LIMES
- CEMENT AND CONCRETE (including concrete reinforcement)
- CEMENT MATRIX PRODUCTS
- CLAY PRODUCTS FOR BUILDING
- CONDUCTORS AND CABLES
- DOORS AND WINDOWS
- ELECTRICAL WIRING FITTINGS AND ACCESSORIES
- FILLERS, STOPPERS AND PUTTIES
- FLOOR COVERING, ROOFING AND OTHER FINISHES
- GLASS
- GYPSUM BUILDING MATERIALS
- LIGNOCELLULOSIC BUILDING MATERIALS (including timber, bamboo and Products thereof)
- PAINTS AND ALLIED PRODUCTS
- POLYMERS, PLASTIC AND GEOSYNTHETICS/ GEOTEXTILES
- SANITARY APPLIANCES AND WATER FITTINGS
- STEEL
- STONES
- STRUCTURAL SECTIONS
- THERMAL INSULATION MATERIALS
- THREADED FASTENERS AND RIVETS
- UNIT WEIGHTS OF BUILDING MATERIALS
- WATERPROOFING AND DAMP-PROOFING MATERIALS
- WELDING ELECTRODES AND WIRES
- WIRE ROPES AND WIRE PRODUCTS

# NEW / ALTERNATIVE BUILDING MATERIALS

- Suitability for End Application
- Strength Properties
- Durability
- Fire Resistivity
- Thermal Properties
- Acoustical Properties
- Ease of Working/Handling
- Energy Conservation/Environment Sustainability

# Major Modifications in **Part 5 Building Materials**

- ▶ Updated provisions for ensuring utilization of number of new/alternative building materials to provide for **innovation** in the field of building construction.
- ▶ Examples of some potential **new/alternative materials**.
- ▶ New clause giving broad aspects relating to **sustainable materials**.
- ▶ Categories reclassified for ease of reference.

# Timber and other Lignocellulose Products

- a) Coniferous & Non-coniferous Timber (IS 190 & 1326)
- b) Plywood (IS 303, 710, 1328, 4990, 5509, 5539, 7316 & 10701)
- c) Block Board (IS 1659)
- d) Particle Board (IS 3087, 3097, 3129, 3478, 12823, 14276 & 15786)
- e) Fibre Board (IS 3348, 12406 & 14587)
- f) LVL , VLL (IS 14616, 16171)
- g) Coir, Jute and Bamboo Based (IS 13958, 14588, 14842, 15476, 15491)

# Doors and Windows

- a) **Panelled Shutters [IS 1003 (Part 1 & 2)]**
- b) **Flush Doors [IS 2191 (Part 1 & 2), IS 2202 (Part 1 & 2), 16074]**
- c) **Ledged, braced and battened door (IS 6198)**
- d) **Metal doors and windows (IS 1038, 1361, 1948 & 1949)**
- e) **Bamboo-Jute Composites (IS 16073 & 16096)**



# CEMENT

IS No.	Title
IS 269:2015	Specification for ordinary Portland cement ( <i>sixth revision</i> )
IS 455:2015	Specification for Portland slag cement ( <i>fifth revision</i> )
IS 1489 (Part 1):2015	Specificity on for Portland pozzolana cement: Part 1 Flyash based ( <i>fourth revision</i> )
IS 1489 (Part 2):2015	Specification for Portland-pozzolana cement: Part 2 Calcined clay based ( <i>fourth revision</i> )
IS 3466:1988	Specification for masonry cement ( <i>second re vision</i> )
IS 6452:1989	Specification for high alumina cement for structural use ( <i>first revision</i> )
IS 6909:1990	Specification for super sulphated cement ( <i>first revision</i> )
IS 8041:1990	Specification for rapid hardening Portland cement ( <i>second revision</i> )
IS 8042:2015	Specification for white Portland cement ( <i>third revision</i> )
IS 8043:1991	Specification for hydrophobic Portland cement ( <i>second revision</i> )
IS 8229:1986	Specification for oil-well cement ( <i>first revision</i> )
IS 12330:1988	Specification for sulphate resisting Portland
IS 12600:1989	Specification for low heat Portland cement
IS 16415:2015	Specification for composite cement

- a) Aggregates for concrete ([IS 383:2016](#))
- b) Artificial Lightweight Aggregate for Concrete — Specification **Part 1** For Concrete Masonry Blocks and for Applications Other than for Structural Concrete ( First Revision ) [[IS 9142 \(Part 1\):2018](#)]
- c) Artificial Lightweight Aggregate for Concrete — Specification **Part 2** Sintered Fly Ash Coarse Aggregate ( First Revision ) [[IS 9142 \(Part 2\):2018](#)]

# Provisions on Use of Aggregates from other than Natural Sources in IS 383:2016

Aggregate type	Slag / Waste included	Maximum utilization in		
		Plain Concrete	Reinforced Concrete	Lean Concrete (less than M15 grade)
<b>1) Coarse Aggregate</b>				
i)	Iron slag coarse aggregate	50%	25%	100%
ii)	Steel slag coarse aggregate	25%	Nil	100%
iii)	Recycled concrete coarse aggregate (See Note 1)	25%	20% (only upto M25 grade)	100%
iv)	Recycled coarse aggregate	nil	Nil	100%
<b>2) Fine Aggregate</b>				
i)	Iron slag fine aggregate	50%	25%	100%
ii)	Steel slag fine aggregate	25%	nil	100%
iii)	Copper slag fine aggregate	40%	35%	50%
iv)	Recycled concrete fine aggregate (See Note 1)	25%	20% (only upto M25 grade)	100%
v)	Bottom Ash	Nil	Nil	25%

## NOTES

- 1 The source concrete for recycled concrete aggregates should not be deteriorated concrete and it is desirable to source these from site being redeveloped for use in the same site.
- 2 In any given structure, only one type of manufactured coarse aggregate and one type of manufactured fine aggregate shall be used.
- 3 The increase in density of concrete due to use of copper slag and steel slag aggregates need to be taken into consideration in the design of structures.

# Concrete

- a) Plain & Reinforced Concrete (IS 456)
- b) Concrete Mix Proportioning (IS 10262:2019)
- c) Prestressed concrete (IS 1343: 2012)
- d) Ready-mixed concrete (IS 4926: 2003)
- e) Concrete for dams and other massive structures (IS 457)
- f) Structural safety of tall concrete buildings (IS 16700:2017)

# Asbestos Cement Products

- a) Corrugated and semi-corrugated AC sheets  
(IS 459:1992)
- b) Asbestos cement flat sheets (IS 2096:1992)
- c) Asbestos cement building boards (IS 2098:1997)
- d) Silica-asbestos cement sheets (IS 13000:1990)
- e) Shallow corrugated AC sheets (IS 13008:1990)
- f) AC pressure pipe (IS 1592:2003)
- g) AC pressure pipe (light duty) (IS 9627:1980)
- h) AC pipes for sewerage and drainage (IS 6908:1991)

# Asbestos Cement Products

- j) AC building pipes and pipe fittings [IS 1626 (Part 1):1994]
- k) AC gutter and gutter fittings [IS 1626 (Part 2):1994]
- m) AC roofing accessories [IS 1626 (Part 3):1994]

## Non-Asbestos Fibre Based Products

- n) Fibre Cement Flat Sheets (IS 14862:2000)
- p) Long corrugated or asymmetrical section sheet and fittings for roofing and cladding (IS 14871:2000)

# Steel Reinforcement

- ▶ Mild steel and medium tensile steel bars  
[ IS 432(Part 1)]
- ▶ High strength deformed steel bars  
(IS 1786: 2008)
- ▶ Hard-drawn steel wire fabric (IS 1566)
- ▶ Grade A of structural steel (IS 2062)
- ▶ High strength deformed **stainless steel** bars  
(IS 16551: 2017)

# Prestressing Steel

- ▶ Plain hard-drawn steel wire for prestressed concrete: Part 1 Cold-drawn stress relieved wire [IS 1785(Part 1): 1983]
- ▶ Plain hard-drawn steel wire for prestressed concrete: Part 2 As drawn wire reinforcement [IS 1785(Part 2): 1983]
- ▶ High tensile steel bars used in prestressed concrete (IS 2090: 1983)
- ▶ Indented wire for prestressed concrete (IS 6003: 2010)
- ▶ Uncoated stress relieved strand for prestressed concrete (IS 6006:2014)
- ▶ Fusion bonded epoxy coated reinforcing bars (IS 13620:1993)
- ▶ Uncoated stress relieved low relaxation seven ply strand for prestressed concrete (IS 14268: 2017)
- ▶ Stress relieved low relaxation steel wire for prestressed concrete (IS 16644: 2018)



# REVISION OF IS 1199 METHODS OF SAMPLING, TESTING AND ANALYSIS OF FRESH CONCRETE

57

Part	Name	Status
Part 1	Sampling of fresh concrete	Published in 2019
Part 2	Determination of consistency of fresh concrete	Published in 2019
Part 3	Determination of density of fresh concrete	Published in 2019
Part 4	Determination of air content of fresh concrete	Published in 2019
Part 5	Making and curing of test specimens	Published in 2019
Part 6	Tests on fresh self compacting concrete	Published in 2019
Part 7	Determination of setting time of concrete by penetration resistance	Published in 2019
Part 8	Determination of water soluble and acid soluble chlorides in mortar and concrete	Draft being prepared
Part 9	Analysis of freshly mixed concrete	Draft being prepared

# REVISION OF IS 516 METHODS OF TEST FOR HARDENED CONCRETE

Part	Name	Status
Part 1	Testing of strength of hardened concrete <b>Section 1</b> Testing the strength of concrete	Under publication
Part 2	Properties of hardened concrete other than strength <b>Section 1</b> Density of Hardened Concrete and Depth of Water Penetration Under Pressure <b>Section 2</b> Initial Surface Absorption <b>Section 3</b> Oxygen Permeability <b>Section 4</b> Determination of the carbonation resistance by accelerated carbonation method	Published in 2019  Under publication Draft being circulated Finalized
Part 3	Making, curing and determining compressive strength of accelerated cured concrete test specimens	Draft being prepared
Part 4	Sampling, preparing and testing of concrete cores	Published in 2019
Part 5	Non-destructive testing of hardened concrete <b>Section 1</b> Ultrasonic Pulse Velocity Testing <b>Section 2</b> Half-cell potentials of uncoated reinforced steel in concrete <b>Section 3</b> Carbonation depth test <b>Section 4</b> Rebound hammer test	Published in 2019  Under publication  Published in 2020

# REVISION OF IS 516 METHODS OF TEST FOR HARDENED CONCRETE

59

Part	Name	Status
Part 6	Determination of drying shrinkage of concrete for samples and moisture movemet	Published in 2020
Part 7	Determination of creep of concrete cylinders in compression	Draft being prepared
Part 8	Determination of modulus of elasticity <b>Section 1</b> Static modulus of elasticity and Poisson's ratio in compression	Published in 2020
Part 9	Wear resistance	Draft being prepared
Part 10	Bond in reinforced concrete	Draft being prepared
Part 11	Determination of Portland cement content of hardened hydraulic-cement concrete	Published in 2020

# New Areas for Standardization

- ❖ Microfine Cement (IS 16693: 2018)
- ❖ GGBS (IS 16714: 2018)
- ❖ Ultrafine GGBS (IS 16715: 2018)
- ❖ Fly Ash Cement Bricks (IS 16720: 2018)
- ❖ Flexural strength and toughness parameter of fiber reinforced concrete — Method of testing (IS 17161:2020)
- ❖ Alkali-activated Concrete for Precast Products (*under publication*) (*Geopolymer concrete*)
- ❖ Precast Concrete Manholes
- ❖ Dry Mix Mortar
- ❖ Ultrafine Fly Ash

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BIS operates a third party certification under the BIS (Certification) Regulations, 1988 which plays a very important role in quality assurance. The third party certification not only encourages the producers/beneficiating agency but also guides them for in-process quality control including regarding the beneficiation, segregation and processing, etc.

# RMC CERTIFICATION

## Ready mix concrete system

- Reduces of risk and increase safety.
- Conformity to regulatory requirements.
- Increases access to more markets.
- Ensure corrective action is taken whenever defects occur.
- Early detection of defects and avoidance of wastage.
- Improved output through Continual improvement.
- Increase in market share, increasing in sales or revenue.
- Better management control and reporting.
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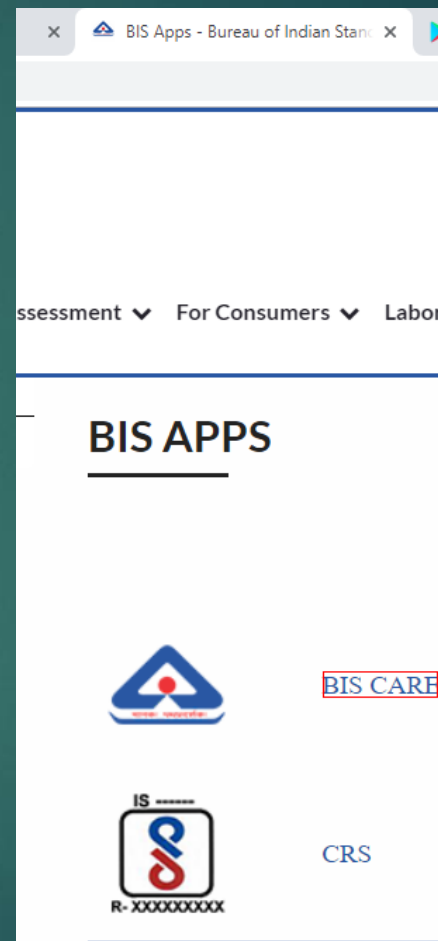
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# PART 6

## STRUCTURAL DESIGN

Section	Title
<b>Section 1</b>	Loads, Forces and Effects
<b>Section 2</b>	Soils and Foundations
<b>Section 3</b>	Timber and Bamboo
Sub section 3A	Timber
Sub section 3B	Bamboo
<b>Section 4</b>	Masonry
<b>Section 5</b>	Concrete
Sub section 5A	Plain and Reinforced Concrete
Sub section 5B	Prestressed Concrete
<b>Section 6</b>	Steel
<b>Section 7</b>	Prefabrication, Systems Building and Mixed/ Composite Construction
Sub section 7A	Prefabricated Concrete
Sub section 7B	Systems Building and Mixed/Composite Construction
<b>Section 8</b>	Glass and Glazing (New)

# Major Modifications in **Part 6/Sec 1 Loads, Forces and Effects**

- ▶ Incorporation of latest structural loading and design and construction codes with a view to ensuring resilient buildings which are structurally safe against disasters.
- ▶ Provisions relating to design imposed load due to **helipad** and due to **fire tenders** and **emergency vehicles**.
- ▶ Provisions relating to design for **blast loads**.
- ▶ Provisions relating to loads due to **collision** between vehicle and structural and non-structural elements in car parking and stilts.
- ▶ Updation of provisions on parapets and balustrades.
- ▶ Provisions relating to new use areas covering appurtenances fixed to the structure.

# Important Standards utilized in Part 6/Sec 1

IS No.	Title
IS 875(Part 2):1987	Code of practice for design loads (other than earthquake) for buildings and structures: Part 2 <b>Imposed loads</b> ( <i>second revision</i> )
IS 875(Part 3): 2015	Code of practice for design loads (other than earthquake) for buildings and structures: Part 3 <b>Wind loads</b> ( <i>third revision</i> )
IS 875(Part 4):1987	Code of practice for design loads (other than earthquake) for buildings and structures: Part 4 <b>Snow loads</b> ( <i>second revision</i> )
IS 875(Part 5):1987	Code of practice for design loads (other than earthquake) for buildings and structures: Part 5 <b>Special loads and load combinations</b> ( <i>second revision</i> )
IS 1893(Part 1):2016	Criteria for <b>earthquake resistant design of structures:</b> Part 1 General provisions and buildings ( <i>sixth revision</i> )

# HILL AREA DEVELOPMENT ENGINEERING

IS No.	Title
IS 14458 (Part 1):1998	Retaining wall for hill area — Guidelines: Part 1 Selection of type of wall
IS 14458 (Part 2):1997	Retaining wall for hill area — Guidelines: Part 2 Design of retaining/breast walls
IS 14458 (Part 3):1998	Retaining wall for hill area — Guidelines: Part 3 Construction of dry stone walls
IS 14458 (Part 4):2018	Retaining wall for hill area — Guidelines: Part 4 Construction of banded dry stone masonry walls
IS 14458 (Part 5):2018	Retaining wall for hill area — Guidelines: Part 5 Construction of cement stone masonry walls
IS 14496 (Part 2):1998	Preparation of landslide hazard zonation maps in mountainous terrains — Guidelines: Part 2 Macro-zonation
IS 14680:1999	Landslide control — Guidelines
IS 14804:2000	Siting design and selection of materials for residential buildings in hilly areas — Guidelines
IS 14961:2001	Rainwater harvesting in hilly areas by roof water collection system — Guidelines

## Standards under publication

Site specific investigations and stability analysis of landslides — Guidelines

Draft Indian Standard preparation of landslide hazard zonation maps in mountainous terrains — Guidelines: Part 1 Meso zonation

Draft Indian Standard preparation of landslide risk assessment maps in mountainous terrains — Guidelines

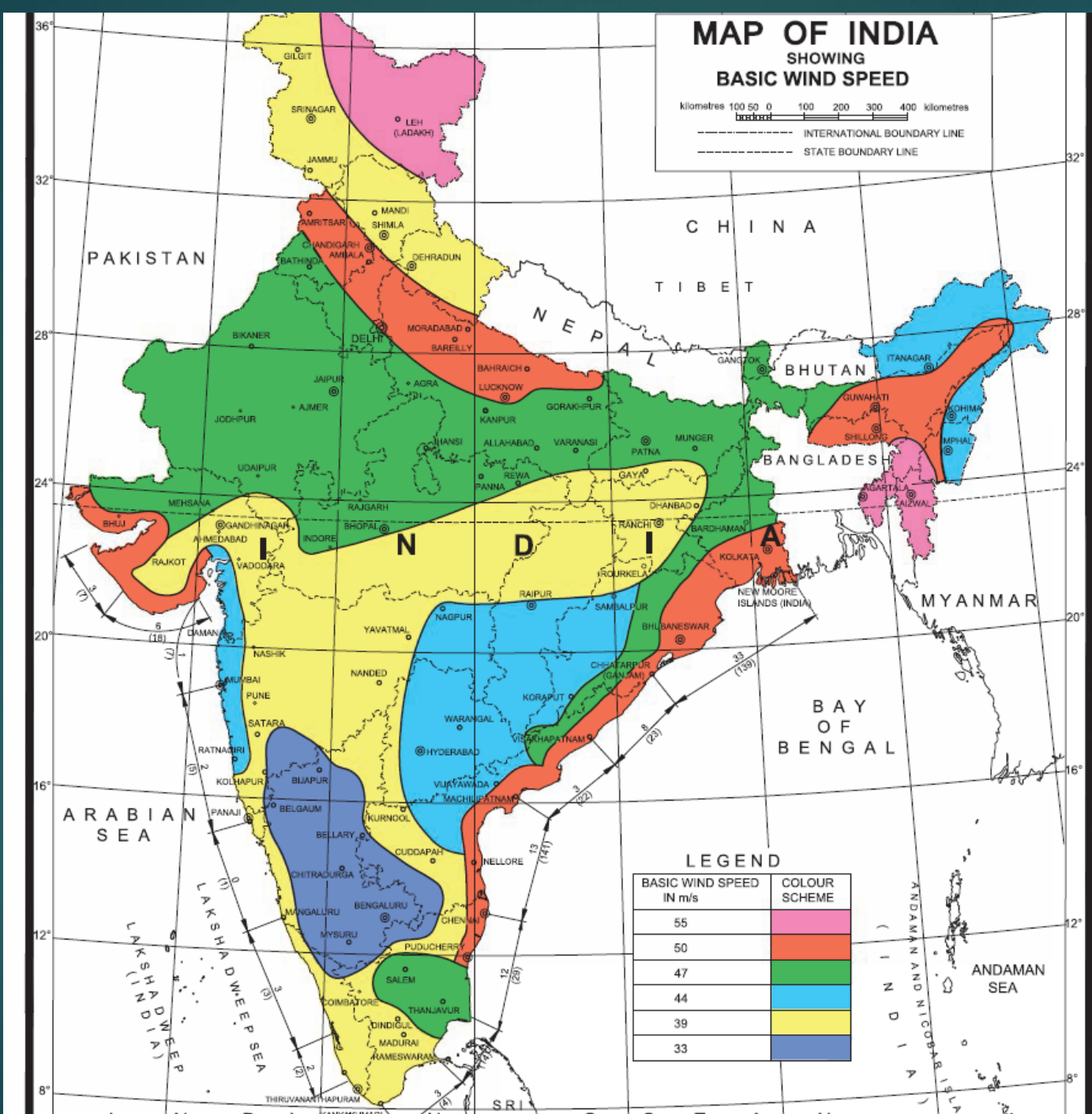
Draft Indian Standard Retaining wall for hill area — Guidelines: Part 6 Construction of gabion walls [IS 14458 (Part 6)]

# CYCLONE RESISTANT STRUCTURES

IS No.	Title
IS 15498:2004	Guidelines for improving the cyclonic resistance of low rise houses and other buildings/structures
IS 15499:2004	Guidelines for survey of housing and building typology in cyclone prone areas for assessment of vulnerability of regions and post cyclone damage estimation

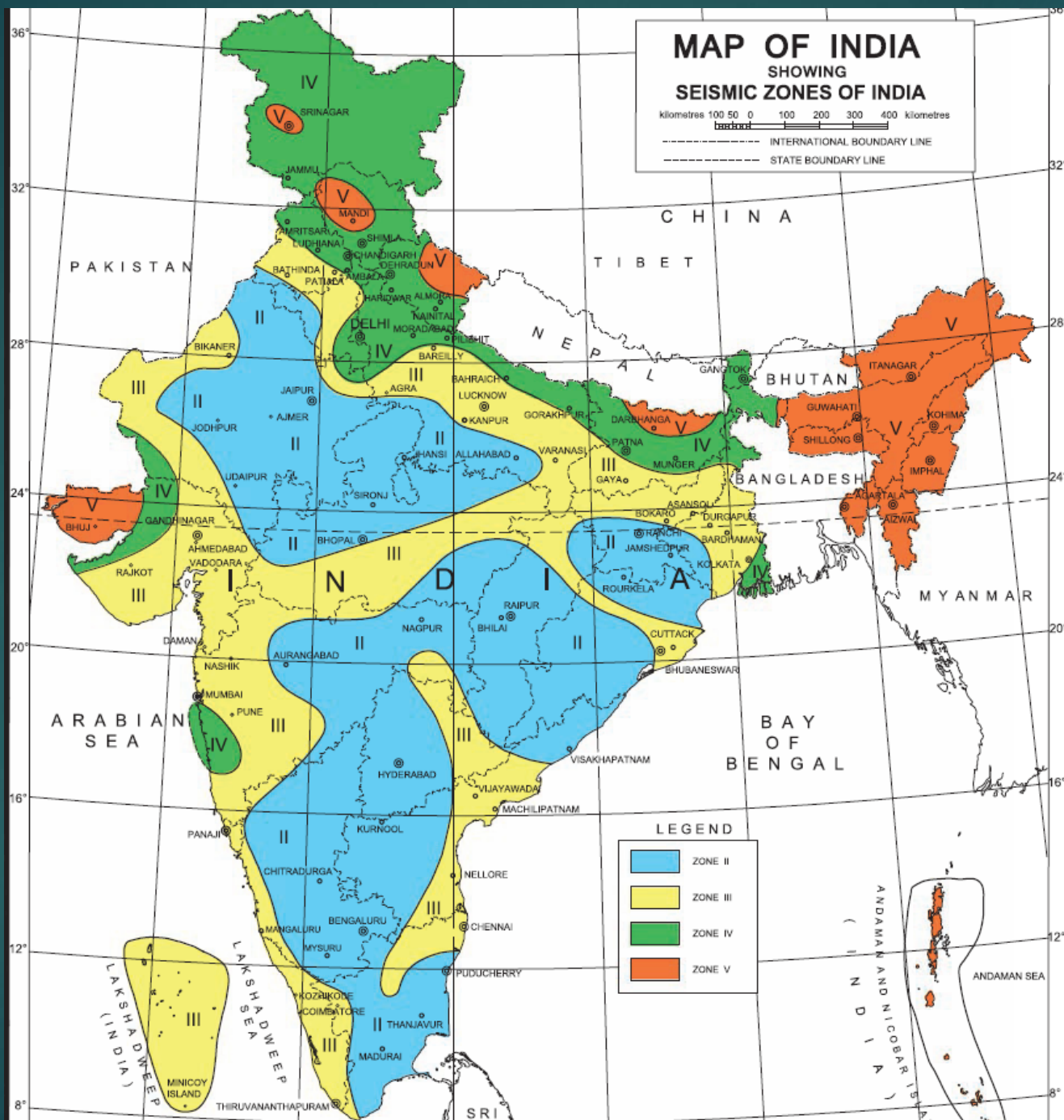
## Standards under publication

Draft Indian Standard design and construction of cyclone shelters  
— Guidelines



2016 Wind Map





2016 Seismic Zoning Map

# Major Modifications in **Part 6/Sec 2 Soils and Foundations**

- ▶ Scope extended to cover design of foundations on rock.
- ▶ Revised clause on site investigation with modifications such as new methods of **soil investigation**; depth of exploration for pile foundations; new sub-clauses on vertical interval for field tests and site investigation report; etc.
- ▶ Updated provisions for permissible **differential settlements** and tilt (angular distortion) for shallow foundations in soils.
- ▶ Updated provisions for design and construction of concrete **pile foundations** based on revised IS 2911 (Part 1/Sec 1 to 4) and IS 2911 (Part 4).
- ▶ A reference to **spun piles** has been included.
- ▶ Updated provisions on **ground improvement techniques** with a table on summary of soil improvement methods.

# Important Standards utilized in Part 6/Sec 2

75

IS No.	Title
IS 1080:1985	Code of practice for design and construction of <b>shallow foundations</b> in soils (other than raft, ring and shell) ( <i>second revision</i> )
IS 1892:1979	Code of practice for <b>subsurface investigation</b> for foundations ( <i>first revision</i> )
IS 1904:1986	Code of practice for design and construction of foundations in soils: General requirements ( <i>third revision</i> )
IS 2911	Design and construction of <b>pile foundations</b> — Code of practice
(Part 1/Sec 1):2010	Concrete piles, Section 1 Driven cast <i>in-situ</i> concrete piles ( <i>second revision</i> )
(Part 1/Sec 2):2010	Concrete piles, Section 2 Bored cast <i>in-situ</i> piles ( <i>second revision</i> )
(Part 1/Sec 3):2010	Concrete piles, Section 3 Driven precast concrete piles ( <i>second revision</i> )
(Part 1/Sec 4):2010	Concrete piles, Section 4 Precast concrete piles in prebored holes ( <i>first revision</i> )

## Standards under Publication

Low strain non-destructive integrity testing of piles — Guidelines (first revision of IS 14893)

Design and construction of pile foundations — Code of practice: Part 2 Timber piles [second revision of IS 2911 (Part 2)]

Design and construction of pile foundations — Code of practice: Part 3 Under-reamed piles [second revision of IS 2911 (Part 3)]

Selection of ground improvement techniques for foundation in weak soils — Guidelines (first revision of IS 13094)

## Standards under Revision

Draft Indian Standard Design and construction of foundations for transmission line towers and poles — Code of practice  
*(second revision of IS 4091)*

Draft Indian Standard Design and construction of machine foundations — Code of practice: Part 1 General provision  
*(revision of IS 2974 Parts 1 to 5)*

Draft Indian Standard Design and construction of machine foundations — Code of practice: Part 2 Block foundation  
*(revision of IS 2974 Parts 1 to 5)*

Draft Indian Standard Design and construction of machine foundations — Code of practice: Part 3 Frame foundation  
*(revision of IS 2974 Parts 1 to 5)*

Draft Indian Standard Design and Construction of Machine Foundation – Code of Practice: Part 5 Foundation for Machines (Excluding Hammers & Presses) Supported on Vibration Isolation System  
*[revision of IS 2974 (Part 1 to 5)]*

# Major Modifications in **Part 6/Sec 3A Timber**

- ▶ Updated design provisions for timber connector joints, lamella roofing, trussed rafters, etc.
- ▶ The permissible lateral strength (in double shear) of mild steel common wire for different **new species of timber** have been added and also strength values for some of the existing species have been modified based on latest research.
- ▶ Data on block shear test results of glued timber joints and on strength properties of **glued finger joints** based on the indigenous work, has been included for guidance in design.
- ▶ Illustrations added for possible orientation of planks in **glue laminated beams** (Glulam).
- ▶ Design outline for horizontally laminated beams has been added.

# Important Standards utilized in Part 6/Sec 3A

IS No.	Title
IS 399:1963	Classification of commercial timbers and their zonal distribution ( <i>revised</i> )
IS 883:2016	Code of practice for design of structural timber in building ( <i>fifth revision</i> )
IS 1150:2000	Trade names and abbreviated symbols for timber species ( <i>third revision</i> )
IS 2366:1983	Code of practice for nail-jointed timber construction ( <i>first revision</i> )
IS 4891:1988	Specification for preferred cut sizes of structural timber ( <i>first revision</i> )
IS 4983:1968	Code of practice for design and construction of nailed laminated timber beams
IS 11096:1984	Code of practice for design and construction of bolt-jointed timber construction
IS 14616:1999	Specification for laminated veneer lumber

# Major Modifications in **Part 6/Sec 3B Bamboo**

- Updated design provisions for
  - bamboo **trusses**, and
  - bamboo **foundations**.
  
- Inclusion of provisions relating to use of
  - **bamboo as reinforcement in concrete**,
  - bamboo based materials/panel products as walling/roofing material, and
  - reconstituted wood from destructured bamboo.



# Important Standards utilized in Part 6/Sec 3B

<b>IS No.</b>	<b>Title</b>
IS 9096:2006	Code of practice for preservation of bamboo for structural purpose ( <i>first revision</i> )
IS 15912:2018	Code of practice for structural design using bamboo ( <i>first revision</i> )

# Major Modifications in **Part 6/Sec 4 Masonry**

- Inclusion of provisions relating to
  - reinforced masonry,
  - confined masonry building construction, and
  - masonry wall construction using rat-trap bond.
  
- ▶ New provisions related to durability criteria for selection of masonry mortars.
  
- ▶ Stabilized soil blocks have been included as masonry unit.
  
- ▶ Number of storeys of masonry construction has been limited to 4, in line with the seismic design standards.

# Important Standards utilized in Part 6/Sec 4

IS No.	Title
IS 1905:1987	Code of practice for structural use of unreinforced masonry ( <i>third revision</i> )
IS 4326:2013	Earthquake resistant design and construction of buildings — Code of practice ( <i>third revision</i> )
IS 10440:1983	Code of practice for construction of RB and RBC floors and roofs
IS 13828:1993	Improving earthquake resistance of low strength masonry buildings — Guidelines

# Major Modifications in Part 6/Sec 5A Concrete

- ▶ Elaborated provisions relating to use of **mineral admixtures**, their effects on properties of fresh and hardened concrete, including precautions associated therewith.
- ▶ Incorporation of **permission to use aggregates from other than natural sources**, including iron slag aggregate, steel slag aggregate, copper slag copper slag aggregate, bottom ash from thermal power plant, and aggregate derived from **construction and demolition waste**, through cross reference to revised IS 383.
- ▶ Inclusion of **stripping time** required in case of concrete made using cement other than OPC or using cementitious materials like fly ash and slag.

# Major Modifications in **Part 6/Sec 5A Concrete**

- ▶ Provisions relating to **self compacting concrete** (SCC) and **high performance concrete** (HPC).
- ▶ Design provisions relating to **steel fibre reinforced concrete** (SFRC) as part of special concretes.
- ▶ Inclusion of provisions relating to shear stress for coupled shear walls.
- ▶ Inclusion of comprehensive provisions on ductile detailing from **IS 13920 : 2016** to help extensive implementation of ductile detailing provisions in all relevant structures.

# Important Standards utilized in Part 6/Sec 5A

<b>IS No.</b>	<b>Title</b>
IS 456:2000	Code of practice for plain and reinforced concrete ( <i>fourth revision</i> )
IS 13920:2016	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces ( <i>first revision</i> )

# Major Modifications in

## Part 6/Sec 5B Prestressed Concrete

87

- ▶ Updated design provisions for prestressed concrete in line with revised IS 1343:2012 and latest practices.
- ▶ Section on materials, workmanship, inspection and testing has been completely modified in line with IS 456 as applicable to prestressing.
- ▶ Provisions related to bearing stress in the end zone in post-tensioned members have been updated.
- ▶ Provisions related to ultimate shear resistance of a section uncracked in flexure and also for that cracked in flexure have been updated.
- ▶ Test on wall thickness of the duct of corrugated HDPE sheathing duct has been updated.

# Important Standards utilized in Part 6/Sec 5B

88

<b>IS No.</b>	<b>Title</b>
IS 1343 : 2012	Code of practice for prestressed concrete ( <i>second revision</i> )



# Major Modifications in **Part 6/Sec 6 Steel**

- ▶ The chapter has been modified in line with **IS 800:2007** and latest developments.
- ▶ The table on tensile properties of structural steel products has been updated by including yield stress values of bolts of sizes 3.6 to 6.8 mm as per IS 1367 (Part 3) and aligning the corresponding provisions of the table with those given in IS 2062:2011.
- ▶ Elaborated provisions for mechanical properties of structural steel.
- ▶ Provisions related to effective wind pressure on exposed circular tube members have been included.
- ▶ Provisions related to requirement of **temperature stress analysis** have been updated.

# Major Modifications in **Part 6/Sec 6 Steel**

- ▶ Provisions related to slender cross sections have been updated, with the inclusion of two new figures on effective sections of slender members under pure and flexural compression.
- ▶ The table on deflection limits has been suitably updated with respect to the load nomenclature of the load and their combinations.
- ▶ Warping restraint conditions in the table on effective lengths for simply supported beams have been clarified.
- ▶ The provision on assessment of conditions under which fatigue assessment is to be done, is covered comprehensively.

# Major Modifications in **Part 6/Sec 6 Steel**

- ▶ Provisions related to design of end panels in stiffened web panels have been updated.
- ▶ Provisions related to design for earthquake loads relating to load and load combinations, response reduction factor for various types of frames, connections in the critical zones of frames, and bracing members have been updated.
- ▶ The nominal bearing pressure between the column base plate and the support has been updated to bring it line with the corresponding provisions of IS 456 : 2000.
- ▶ Provisions related to design of single angle struts loaded through one leg have been revised.
- ▶ Provisions related to non-ductile braced and moment resisting frames have been included.

# Major Modifications in **Part 6/Sec 6 Steel**

- ▶ Provisions on ductile designing with respect to column base connections have been updated.
- ▶ Reference design conditions under fatigue for S-N curve have been modified.
- ▶ Provisions on clearances related to fabrication procedures have been updated.
- ▶ Sketches of the restraint conditions under table on effective lengths of single stepped columns have been updated.
- ▶ Certain terminologies, symbols and figures have been updated based on the changes incorporated.

# Important Standards utilized in Part 6/Sec 6

<b>IS No.</b>	<b>Title</b>
IS 800 : 2007	Code of practice for general construction in steel ( <i>third revision</i> )
IS 806: 1968	Code of practice for use of steel tubes in general building construction ( <i>first revision</i> )

# Major Modifications in **Part 6/Sec 7A Prefabricated Concrete**

- ▶ Inclusion of emulative system of prefabricated concrete with detailed provisions in respect of its definition, analysis, design, detailing, etc.
- ▶ Detailed provisions on **diaphragm action of floor systems** have been included.
- ▶ Design considerations have been updated where **accidental impact due to vehicles** has been included.
- ▶ Provisions and testing procedures for **water tightness of joints** have been included.
- ▶ Some of the **typical precast joint details** have been illustrated.

# Major Modifications in **Part 6/Sec 7A Prefabricated Concrete**

- ▶ Provisions relating to **fire resistance testing of prototypes** under sustained load has been provided for.
- ▶ Connection between adjacent prefabricated members only through frictional resistance has been removed and suggestions for **resistance using shear** has been included.
- ▶ Provisions on **site prefabrication** have been updated.
- ▶ Guidelines (restriction on the number of components) on vertical stacking on ground have been included.
- ▶ Provisions for **tolerances in erection** and associated design considerations have been included.

# Major Modifications in Part 6/Sec 7B Systems Buildings and Mixed/Composite Construction

- Updated provisions in respect of the following aspects of systems building and mixed/composite construction:
  - definition,
  - analysis,
  - design,
  - detailing, etc.
- Aspects relevant to devising **systems and structural schemes** have been updated.



# New Chapter

## Part 6/Sec 8 Glass and Glazing

97

- This new chapter on **structural use of glass** covers
  - different types of glass, their requirements and associated glazing materials;
  - **selection and application** of glass in buildings,
  - provision for glazing w.r.t. their effect on **energy**, visual (light) and solar environments in the building;
  - selection of glass in buildings, subject to **wind loading**, **seismic loading** and special considerations for fire rated glass and related materials;
  - provisions for the selection and manifestation of glass in buildings, subject to **safety with respect to human impact** of the occupants; and
  - provisions relating to **selection, design, fabrication and installation of glazing systems**.

# Important Standards utilized in Part 6/Sec 8

IS No.	Title
IS 16231	Code of practice for <b>use of glass</b> in buildings:
(Part 1) : 2019	General methodology and selection
(Part 2) : 2019	Energy and light
(Part 3) : 2019	Fire and loading
(Part 4) : 2019	Safety related to human impact

# Construction Project Management

IS No.	Title	Current Stage
<b>IS 15883</b>	<b>Construction Project Management-Guidelines:</b>	
Part 1:2009	Part 1 General	Published
Part 2:2013	Part 2 Time Management	Published
Part 3:2015	Part 3 Cost Management	Published
Part 4:2015	Part 4 Quality Management	Published
Part 5:2013	Part 5 Health & Safety Management	Published
Part 6:2015	Part 6 Scope Management	Published
Part 7	Part 7 Procurement Management	Under Publication
Part 8:2015	Part 8 Risk Management	Published
Part 9:2018	Part 9 Communication Management	Published
Part 10	Part 10 Human Resource Management	Under Publication
Part 11	Part 11 Sustainability Management	Under Publication
Part 12:2016	Part 12 Integration Management	Published
<b>IS 16416:2016</b>	<b>Guidelines for Construction Project Formulation and Appraisal</b>	Published
<b>IS 16601:2016</b>	<b>Guidelines for Habitat and Welfare Requirements for Construction Workers</b>	Published

# Major Modifications in

## Part 7 Construction Management, Practices and Safety

100

- Updated provisions for ensuring utilization of number of **new/alternative building technologies** to provide for innovation in the field of building construction.
- Incorporation of **construction management guidelines** to aid in timely completion of building projects in a safe manner with desired quality and within the budgeted cost.
- Inclusion of **requirements for habitat and other welfare requirements for workmen at construction site**.
- Updated provisions on safety in construction.

# SAFETY CODES RELATED TO ALL KINDS OF CONSTRUCTION ACTIVITY



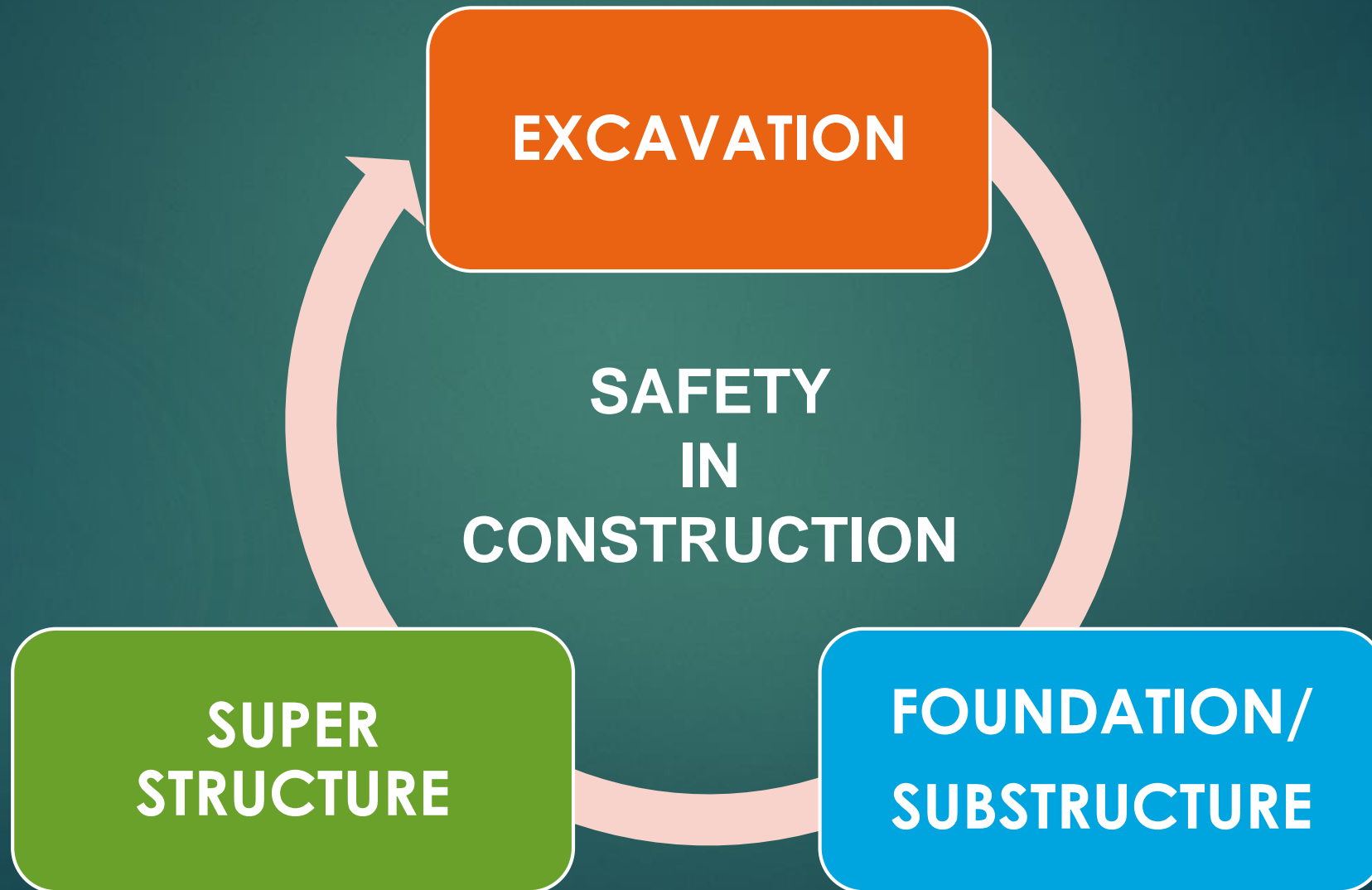
# SAFETY GUIDELINES

## Safety guidelines during different construction operations such as during

• excavation	• demolition
• drilling and blasting	• steel erection
• piling and deep foundations	• in construction of concrete framed structure
• tunneling	• during material handling
• road making	• while working in compressed air
• at floor and wall openings	• in use of tools
• in use of construction machinery	• from common hazards
• working at height	

- Concept of safety committees/management
- Habitat and welfare requirements for construction workers
- Safety in electrical installations for construction sites and demolition sites

# SAFETY CODES RELATED TO ALL PHASES OF CONSTRUCTION



# SAFETY CODES RELATED TO EXCAVATION



**IS 3764:1992** Code of safety for excavation work



**IS 4081:2013** Code of safety for blasting and related drilling operations



# SAFETY CODES RELATED TO SUBSTRUCTURE



**IS 5121:2013** Code of  
safety for piling and  
other deep foundations

# SAFETY CODES RELATED TO SUPERSTRUCTURE



**IS 8989:1978** Safety code for erection of concrete framed structures



**IS 7205:1974** Safety code for erection of structural steelwork



**IS 4912:1978** Safety requirements for floor and wall openings, railings and toe boards

# SAFETY CODES RELATED TO ADDITION/ALTERATION OR DEMOLITION OF BUILDINGS

**IS 13430:1992** Code of practice for safety during additional construction and alteration to existing buildings

**IS 4130:1991** Safety code for demolition of buildings

# SAFETY CODES RELATED TO ENABLING WORKS

Staging (Scaffolds & ladders)

- **IS 3696 (Part 1):1987** Safety code of scaffolds and ladders: Part 1 Scaffolds
- **IS 3696 (Part 2):1991** Safety code of scaffolds and ladders: Part 2 Ladders
- **IS 4014 (Part 2):2013** Code of practice for steel tubular scaffolding: Part 2 Safety regulations for scaffolding

Material

- **IS 7969:1975** Safety code for handling and storage of building materials

Machinery

- **IS 7293:1974** Safety code for working with construction machinery

# OTHER SAFETY CODES

- **IS 818 : 1968** Code of practice for safety and health requirements in electric and gas welding and cutting operations
- **IS 13415:1992** Code of safety for protective barriers in and around buildings
- **IS 13416(Part 1):1992** Recommendations for preventive measures against hazards at workplaces:  
Part 1 Falling material hazards prevention
- **IS 13416(Part 2):1992** Recommendations for preventive measures against hazards at workplaces:  
Part 2 Fall prevention
- **IS 13416(Part 3):1994** Recommendations for preventive measures against hazards at workplaces:  
Part 3 Disposal of debris
- **IS 13416(Part 4):1994** Recommendations for preventive measures against hazards at workplaces:  
Part 4 Timber structure
- **IS 13416(Part 5):1994** Recommendations for preventive measures against hazards at workplaces:  
Part 5 Fire protection

## OTHER SAFETY CODES

- **IS 4138:1977** Safety code for working in compressed air
- **IS 4756:1978** Safety code for tunneling work
- **IS 5916:2013** Safety code for construction involving use of hot bituminous materials
- **IS 10291:1982** Safety code for dress divers in civil engineering works
- **IS 15883(Part 5):2013** Guidelines for construction project management: Part 5 Health and safety management
- **IS 15883(Part 8):2015** Guidelines for construction project management: Part 8 Risk management
- **IS 16601:2016** Guidelines for habitat requirements for construction workers
- **SP 70:2001** Handbook on construction safety practices

# SAFETY EQUIPMENT/SIGNS, SELECTION, MAINTENANCE AND CARE OF SAFETY EQUIPMENT AND OCCUPATIONAL HEALTH & SAFETY

SAFETY EQUIPMENT/SIGNS	
<b>IS 3521 : 1999</b>	Industrial safety belts and harnesses - Specification
<b>IS 5983 : 1980</b>	Eye-protectors
<b>IS 6994 ( Part 1) : 1973</b>	Safety Gloves: Part 1 Leather And Cotton Gloves
<b>IS 8521 ( Part 1) : 1977</b>	Industrial safety face shields: Part 1 With plastic visor
<b>IS 8521 ( Part 2) : 1994</b>	Industrial safety face-shields: Part 2 With wire mesh visor
<b>IS 8095 : 1976</b>	Accident Prevention Tags
<b>IS 9457 : 2005</b>	Safety colours and safety signs - Code of Practice
<b>IS 8347 : 2008</b>	Respiratory Protectives: Definitions, classification and nomenclature of components
<b>IS 9473 : 2002</b>	Respiratory Protective Devices - Filtering Half Masks to Protect Against Particles
<b>IS 9563 : 1980</b>	Carbon monoxide filter self-rescuers

# SAFETY EQUIPMENT/SIGNS, SELECTION, MAINTENANCE AND CARE OF SAFETY EQUIPMENT AND OCCUPATIONAL HEALTH & SAFETY

SAFETY EQUIPMENT/SIGNS	
<b>IS 10245 ( Part 1 ) : 1996</b>	Respiratory protective devices - Breathing apparatus: Part 1 Closed circuit breathing apparatus compressed oxygen cylinder
<b>IS 10245 ( Part 2 ) : 1994</b>	Respiratory protective devices - Breathing apparatus Part 2 Open circuit breathing apparatus
<b>IS 10245 ( Part 3 ) : 1999</b>	Respiratory protective devices - Breathing Apparatus: Part 3 Fresh Air Hose and Compressed Air Line Breathing Apparatus
<b>IS 10245 ( Part 4 ) : 1982</b>	Respiratory protective devices - Breathing apparatus: Part 4 Escape breathing apparatus short duration self-contained type
<b>IS 10592 : 1982</b>	Industrial emergency showers, eye and face fountains and combination units
<b>IS 13293 : 1992</b>	Gas Detector Tubes - General Requirements and Methods of Test
<b>IS 13366 : 1992</b>	Resuscitators Intended for Use with Humans
<b>IS 14138 ( Part 1 ) : 1994</b>	Respiratory protective devices threads for face pieces: Part 1 Standard thread connection
<b>IS 14138 ( Part 2 ) : 1994</b>	Respiratory protective devices threads for face pieces: Part 2 Centre thread connection
<b>IS 14166 : 1994</b>	Respiratory protective devices - Full face masks



# SAFETY EQUIPMENT/SIGNS, SELECTION, MAINTENANCE AND CARE OF SAFETY EQUIPMENT AND OCCUPATIONAL HEALTH & SAFETY

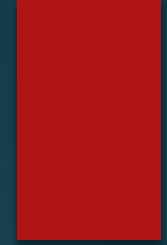


SAFETY EQUIPMENT/SIGNS	
<b>IS 14170 : 1994</b>	Respiratory Protective Devices - Mouthpiece Assemblies
<b>IS 14744 : 1999</b>	Flame Retardant Protective Hoods
<b>IS 14746 : 1999</b>	Respiratory Protective Devices: Half Masks And Quarter Masks
<b>IS 15071 : 2002</b>	Chemical Protective Clothing - Specification
<b>IS 15321 : 2003</b>	Molten Metal Splash Protective Hoods
<b>IS 15322 : 2003</b>	Particle Filters Used in Respiratory Protective Equipment
<b>IS 15323 : 2003</b>	Gas Filters and Combined Filters Used in Respiratory Protective Equipment
<b>IS 15803 : 2008</b>	Respiratory protective devices - Self contained closed circuit breathing apparatus chemical oxygen KO <sub>2</sub> type self generating self rescuers
<b>IS 15809 : 2008</b>	High Visibility Warning Clothes

# SAFETY EQUIPMENT/SIGNS, SELECTION, MAINTENANCE AND CARE OF SAFETY EQUIPMENT AND OCCUPATIONAL HEALTH & SAFETY

SELECTION, MAINTENANCE AND CARE OF SAFETY EQUIPMENT	
<b>IS 8519 : 1977</b>	Guide for selection of industrial safety equipment for body protection
<b>IS 8520 : 1977</b>	Guide for selection of industrial safety equipment for eye face and ear protection
<b>IS 8807 : 1978</b>	Guide for selection of industrial safety equipment for protection of arms and hands
<b>IS 8940 : 1978</b>	Code of practice for maintenance and care of industrial safety equipment for eyes and face protection
<b>IS 8990 : 1978</b>	Code of practice for maintenance and care of industrial safety clothing
<b>IS 9623 : 2008</b>	Selection, use and maintenance of respiratory protective devices - Code of practice
<b>IS 10667 : 1983</b>	Guide for selection for industrial safety equipment for protection of foot and leg

# SAFETY EQUIPMENT/SIGNS, SELECTION, MAINTENANCE AND CARE OF SAFETY EQUIPMENT AND OCCUPATIONAL HEALTH & SAFETY



OTHERS RELATING TO OHSAS AND MONITORING	
<b>IS 8091 : 2008</b>	Industrial plant layout - Code of safe practice
<b>IS 9679 : 1980</b>	Code of practice for work environmental monitoring air borne contaminants
<b>IS 14489 : 1998</b>	Code of practice on occupational safety and health audit
<b>IS 15793 : 2007</b>	Managing environment Occupational health and safety legal compliance - Requirements of good practices
<b>IS 18001 : 2007</b>	Occupational Health and Safety Management Systems - Requirements with Guidance for Use
<b>IS 8091 : 2008</b>	Industrial plant layout - Code of safe practice
<b>IS 9679 : 1980</b>	Code of practice for work environmental monitoring air borne contaminants

# INDIAN LEGISLATIONS RELATING TO SAFETY DURING BUILDING CONSTRUCTION

*(ILLUSTRATIVE NOT EXHAUSTIVE)*

- ❖ *Building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996*
- ❖ *Building and other Construction Workers (Regulation of Employment & Conditions of Service) Central Rules, 1998*
- ❖ *The Factories Act, 1948 (Amended 1987 & 2001) and the State Factories Rules of respective States*

# PART 8

## BUILDING SERVICES

Section	Title
<b>Section 1</b>	Lighting and Natural Ventilation
<b>Section 2</b>	Electrical and Allied Installations
<b>Section 3</b>	Air Conditioning, Heating and Mechanical Ventilation
<b>Section 4</b>	Acoustics, Sound Insulation and Noise Control
<b>Section 5</b>	Installation of Lifts and Escalators and Moving Walks
Sub section 5A	Lifts
Sub section 5B	Escalators and Moving Walks ( <i>New</i> )
<b>Section 6</b>	Information and Communication Enabled Installations ( <i>New</i> )

# Major Modifications in Part 8/Sec1 Lighting and Natural Ventilation

- ▶ Updated provisions relating to **efficient** artificial light source and **luminaires** and **photocontrols** for artificial lights.
- ▶ Inclusion of modern lighting techniques such as **LED** and **induction light** vis-à-vis their energy consumption.
- ▶ Reference to SP 41:1987 for obtaining coefficient utilization for determination of luminous flux has been included.
- ▶ Enabling provisions for **lighting shelves** and **light pipes** have been included.

# Major Modifications in **Part 8/Sec1 Lighting and Natural Ventilation**

- ▶ The provisions related to thermal comfort clause have been elaborated including therein indices such as effective temperature, **adaptive thermal comfort** along with elaborations on tropical summer index.
- ▶ Design guidelines for **natural ventilation** have been elaborated with illustrations.
- ▶ Provisions related to determination of rate of ventilation particularly on **combined effect of wind and thermal actions** have been elaborated.
- ▶ Provision on colour rendering has been included in line with that in SP 72 : 2010 'National Lighting Code 2010'.

# Major Modifications in

## Part 8/Sec 2 Electrical and Allied Installations

120

- ▶ Updation of the chapter for ensuring alignment with The Indian Electricity Act, 2003 and various **CEA Regulations** framed thereunder particularly Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2010.
- ▶ Updated provisions on location and other requirements relating to layout, environmental and safety aspects for different substation apparatus/equipment and generating sets.
- ▶ Inclusion of provisions relating to location of **compact substations**.
- ▶ Updated provisions for reception and distribution of supply and wiring installations and for installation of energy meters with due cognizance to the Indian Standards formulated.



# Major Modifications in

## Part 8/Sec 2 Electrical and Allied Installations

121

- ▶ Revised provisions for **earthing/grounding**.
- ▶ Comprehensive revision of provisions relating to **lightning protection** of buildings.
- ▶ Inclusion of provisions relating to **renewable energy sources** for building, such as solar PV system; aviation obstacle lights; electrical supply for electric vehicle charging and car park management; etc.
- ▶ New provisions relating to **electrical installations for construction sites and demolition sites**.
- ▶ Inclusion of provisions relating to **protection of human beings** from electrical hazards and protection against fire in the building due to **leakage current**.

# Major Modifications in

## Part 8/Sec 3 Air conditioning, Heating and Mechanical Ventilation

122

- ▶ Modified provisions on refrigerants for air conditioning to include new **refrigerants with zero ODP** and **ultra-low GWP** including natural refrigerants.
- ▶ Inclusion of **other available options of HVAC** such as, VRF system, inverter technology, district cooling system, and hybrid central plant using chilled beams, radiant floor components, geo-thermal cooling and heating, etc.
- ▶ Thrust on envelope optimization using **energy modelling**, **day lighting simulation**, **solar shade analysis** and **wind modelling** software to optimize the air conditioning load.
- ▶ Indoor design conditions for comfort HVAC now based on adaptive comfort conditions for the specific climatic zone.

# Major Modifications in Part 8/Sec 3

123

- ▶ Updated provisions on HVAC requirements for **data centres** and **healthcare facilities** and inclusion of such requirements for **underground metro stations**.
- ▶ Incorporation of refrigeration for **cold stores**.
- ▶ Inclusion of most efficient strategies for winter heating, using **reverse cycle operation**, solar heating systems, electric heat pump, and ground source heat pump.
- ▶ Coverage of **modern system of mechanical ventilation** for industries, commercial kitchen, underground car parking, and for open tunnels connecting underground metro stations.
- ▶ Updated provisions on **building automation** system to include the latest practices for web-based monitoring and control of performance parameters.

# Major Modifications in

## Part 8/Sec 4 Acoustics, Sound Insulation and Noise Control

124

- ▶ Updated provisions on **sound insulation** and **noise control** measures in buildings.
- ▶ New clause on **construction noise**.
- ▶ The provision relating to noise control in open plan schools has been deleted, owing to the changed scenario.
- ▶ **Reverberation times** of classrooms and assembly halls in schools have been modified.
- ▶ Requirement of **insulation** (Rw) for walls or partitions between rooms **in hospitals** have been modified.
- ▶ Recommended **maximum reverberation time** for very large offices and for canteens have been modified.

# Major Modifications in **Part 8/Sec 5A Lifts**

- ▶ Inclusion of requirements for high speed lifts and **lifts for tall buildings** including elaboration of **lifts for fire-fighting and emergency evacuation** and inclusion of considerations for **machine room less** (MRL) lifts.
- ▶ Updation of preliminary design provisions for lifts to cover the requirements for various building functions.
- ▶ Inclusion of provisions for **seismic resistance aspects** in lifts.

# New Chapter

## Part 8/Sec 5B Escalators and Moving Walks

126

- This **new chapter** on escalators and moving walks covers all aspects relating to their
  - Planning;
  - Installation;
  - Operation, maintenance; and
  - Inspection

for ensuring safe movement of people with satisfactory performance.

## New Chapter

### Part 8/Sec 6 Information and Communication Enabled Installations

127

- This new chapter on **information and communication enabled installations** covers
  - essential requirements for ICT installations;
  - technology systems and cabling installations in a building;
  - general guidelines required for planning and providing ICT services in the building at the planning and execution stages;
  - basic design and integration requirements for **telecommunication spaces within building**/buildings along with their cabling infrastructure, their pathway components and passive connectivity hardware; and
  - general requirements relating to installation of different communication equipment, cable terminations and power connections.

# PART 9

## PLUMBING SERVICES

- Section 1 Water Supply
- Section 2 Drainage and Sanitation
- Section 3 Solid Waste Management **(New)**
- Section 4 Gas Supply



# Major Modifications in **Part 9/Sec 1 Water Supply**

- ▶ Water supply requirements for buildings based on estimated occupancy in the chosen type of building.
- ▶ Updation of water requirements for non-residential buildings with **separate domestic and flushing requirements**.
- ▶ Updation of number of various water supply fixture unit and **probable simultaneous demand**, with demand values up to 10,000 fixture units.
- ▶ Updated provisions for water supply distribution systems in **multi-storeyed buildings** with illustrations therefor.
- ▶ Inclusion of provisions relating to **swimming pools**.

# Major Modifications in **Part 9/Sec 2 Drainage and Sanitation**

- ▶ Various additional requirements relating to layout of drainage and sanitation system have been added.
- ▶ Inclusion of provisions on **venting system for high rise buildings**.
- ▶ Updation of **number** of various drainage **fixture unit**.
- ▶ Revised **sizes of rainwater pipes** for efficient roof drainage.
- ▶ Updated provisions on **rainwater harvesting** and artificial ground water recharge.

# New Chapter

## Part 9/Sec 3 Solid Waste Management

131

- This new chapter on **solid waste management** covers
  - various solid waste management systems,
  - assessment of per capita solid waste quantities, and
  - treatment of solid waste within the building, building complexes and their built environments.
  
- ▶ References to latest applicable statutory Rules and Regulations have been included.
  
- ▶ An informative Annex relating to municipal solid waste generation has been included, covering quantity, type, description and sources of solid waste generation.
  
- ▶ An Annex relating to treatment of food waste has also been included.

# Major Modifications in **Part 9/Sec 4 Gas Supply**

132

- ▶ Revised provisions on LPG supply in buildings
- ▶ Detailed provisions on PNG supply in buildings
- ▶ New provisions on medical gas pipeline system

# PART 10

## LANDSCAPE DEVELOPMENT, SIGNS AND OUTDOOR DISPLAY STRUCTURES

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

**Section 2** Signs and Outdoor Display Structures

# Major Modifications in **Part 10/Sec 1 and 2**

- ▶ Updated provisions on landscape planning, design and development and signs and outdoor display structures.
- ▶ New clause on **landscape site planning** requirements.
- ▶ A new clause relating to **roof landscape** has been added.
- ▶ New provisions related to **materials and finishes** plan have been included as part of the landscape development documents required for statutory approvals.
- ▶ Part 10/Sec 2 has been linked with Part 3 of the Code for ensuring appropriate **controls of signs** as applicable for the purpose of **accessibility for persons with disabilities**

# Major Modifications in

## Part 11 Approach to Sustainability

135

- ▶ Updation of the new Part 11 'Approach to Sustainability' which was added to NBC 2005 through its Amendment No. 1 for covering guidelines for making buildings and built environment energy efficient and environmentally compatible.
- ▶ Covers **all aspects of energy conservation** such as **electrical** energy conservation, **water** conservation, use of **low embodied** energy materials, renewable energy utilization, etc.
- ▶ The chapter is intended to help in meeting relevant **sustainable development goals (SDG)** laid down by the **United Nations**.

# OUTLINE OF PART 11 APPROACH TO SUSTAINABILITY

- 1 SCOPE
- 2 TERMINOLOGY
- 3 APPROACH TO SUSTAINABILITY
- 4 APPLICABILITY OF THIS PART OF THE CODE
- 5 SITING, FORM AND DESIGN
- 6 EXTERNAL DEVELOPMENT AND LANDSCAPE
- 7 ENVELOPE OPTIMIZATION
- 8 MATERIALS
- 9 WATER AND WASTE MANAGEMENT
- 10 BUILDING SERVICES OPTIMIZATION
- 11 CONSTRUCTIONAL PRACTICES
- 12 COMMISSIONING, OPERATION, MAINTENANCE AND PERFORMANCE TRACKING



# New Chapter

## Part 12 Asset and Facility Management

137

- This new chapter on **asset and facility management** covers
  - provisions relating to management of building assets and associated services;
  - provisions to deal with issues relating to maintenance of all types of facilities and fixed assets such as buildings and building services (includes both hard and soft services such as **building fabric maintenance, roads and pathways, security, MEP services including fire safety installations, housekeeping**, etc;
  - Provisions for identifying critical activities and critical assets which need to be focused upon by facility managers; and
  - **responsibilities of occupants** for maintenance of facilities, such as, structures, equipment and exterior property

# ENORMOUS NATIONAL INVOLVEMENT AND RESPONSE IN REVISION

138

## IMPLEMENTATION DRIVE

- Central Government
- States Government
- State Local Bodies
- State Fire Authorities
- Planning Commission
- Housing Finance Institutions (RBI, HUDCO, NHB)
- Academic Institutions

# ADOPTION OF NBC - WAY FORWARD

139

<b>Mega Cities (8)</b>	<b>Population of over 50 Lakhs – Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad, Pune</b>
<b>Metro Cities (45)</b>	<b>10 to 50 Lakhs</b>
<b>Municipal Corporations (121)</b>	<b>5 Lakhs and above</b>
<b>City Municipalities (A class)</b>	<b>1 Lakh and above</b>
<b>Town Municipalities (B &amp; C class) / Town Panchayats</b>	<b>5,000 – 1,00,000</b>
<b>Rural Areas</b>	

53 million plus cities/urban agglomerations – 70 by 2021

# SOME SIGNIFICANT EARTHQUAKES IN INDIA

140

Year	Place	Magnitude
1819	Kutch	8.0
1869	Near Cachar (Assam)	7.5
1885	Sopor (J&K)	7.0
1897	Shillong	8.7
1918	Shrimangal (Assam)	7.6
1930	Dhubri (Assam)	7.1
1934	Bihar-Nepal Border	8.3
1941	Andaman	8.1
1943	Assam	7.2
1950	Arunachal-China Border	8.5
1956	Anjar (Gujarat)	7.0

# SOME SIGNIFICANT EARTHQUAKES IN INDIA (Contd...)

141

Year	Place	Magnitude
1967	Koyna	6.5
1975	Kinnaur	6.2
1988	Manipur-Myanmar Border	6.6
1988	Bihar-Nepal Border	6.4
1991	Uttarkashi	6.6
1993	Latur-Osmanabad	6.3
1997	Jabalpur	6.0
1999	Chamoli	6.8
2001	Bhuj	6.9
2005	J&K	7.4
2015	Nepal - Bihar	7.9

# ENFORCEMENT

142

The Building Regulatory Media consist of



- Building Byelaws
- Building Rules
- Planning Standards
- Development Control Rules
- Fire Regulations
- Town Planning Rules
- Hazard Mapping Rules
- Water Supply Byelaws
- Drainage Byelaws

**These regulatory documents have to be brought in line with NBC 2016**

**New Standards (*under development*)**

UPVC Profiles for Windows and Doors – Specification **(CED 11)**

Test Methods for Wind Load, Water Tightness, Air Tightness and Sound Insulation of Aluminium & UPVC Windows **(CED 11)**

Wood Polymer Composite Board – Specification **(CED 20)**

Flattened Bamboo Board – Specification **(CED 20)**

BWP Grade Bamboo Mat Board – Specification **(CED 20)**

BWP Grade Bamboo Mat Veneer Composite – Specification **(CED 20)**

Medium Density Fibre Board Flooring – Specification **(CED 20)**

Aluminium Composite Panel – Specification **(CED 05)**

Ceramic Tiles — Method of Test for Slip Resistance **(CED 05)**

Methods of Tests for Burnt Clay Building Bricks – Determination of Initial Rate of Absorption **(CED 30)**

Methods of Tests for Burnt Clay Building Bricks – Determination of Modulus of Rupture **(CED 30)**

Code of practice for Use of structural steel in overhead Transmission line towers – Part 5 Erection **(CED 07)**

Code of practice for communication and broadcasting towers using structural steel **(CED 07)**

Code of practice for firing range **(CED 38)**

Sustainable development of habitats – Indicators for smart cities **(CED 59)**

**New Standards** *(under development)*

Sustainable development of habitats – Indicators for smart cities **(CED 59)**

Sustainable development of habitats – Indicator for resilient cities **(CED 59)**

Structural Sealants **(CED 13)**

Guidelines for Masonry Walls Using Rat-Trap Bond Technology **(CED 13)**

Metal Framing Components for gypsum plasterboard systems — Specification **(CED 13)**

IS/ISO 21925 – 2 Fire Dampers for Air Distribution Systems **(CED 36)**

Fire Safety of Commercial Kitchen **(CED 36)**

Fire Safety of Hospitals **(CED 36)**

Perimeter Fire Barrier System **(CED 36)**

Smoke and Heat Control Systems (ISO 21927-3) **(CED 36)**

Probabilistic Seismic Hazard Map (PSHM) of India **(CED 39)**

Seismic Design and Detailing of New Structures – Steel Buildings **(CED 39)**

Post-Earthquake Damage Assessment of Structural Elements – Pipelines **(CED 39)**

Performance Based Design **(CED 39)**



**New Standards** *(under development)*

Structural Use of Confined Masonry **(CED 39)**

IS 1893-6 Base Isolated Structures **(CED 39)**

Ultra-fine Fly Ash **(CED 02)**

Dry Mix Mortar **(CED 02)**

Dry RMC Mix **(CED 02)**

Code of practice for planning and design of ports and harbours: Part 6 Environmental Impact Assessment [IS 4651 (Part 6) **(CED 47)**

Requirements for Water Efficient Plumbing Products: Part 1 Sanitary Appliances **(CED 03)**

Requirements for Water Efficient Plumbing Products: Part 2 Sanitary Fittings **(CED 03)**

Stainless steel water tanks **(CED 03)**

Specification for Beta outflow valve **(CED 03)**

Cold reduced steel wire for manufacture of welded fabric for concrete reinforcement **(CED 54)**

Specification for UPVC Column pipe **(CED 50)**

Specification for polypropylene pipe for soil and waste discharge within the building structure **(CED 50)**

## **New Standards** *(under development)*

Specification for PVC lay flat hoses **(CED 50)**

Thermoplastic pipes for the conveyance of fluids – Determination of resistance to rapid crack propagation (RCP) – Small scale steady state test (S4 test) **(CED 50)**

Polyolefin pipes for the conveyance of fluids – Determination of resistance to crack propagation – Test method for slow crack growth on notched pipes **(CED 50)**

Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds **(CED 50)**

Specification for Biodigestor **(CED 24)**

Specification for Prefabricated septic tank **(CED 24)**

Panic exit hardware **(CED 15)**

Pull Handles **(CED 15)**

Precast manhole **(CED 53)**

Inspection Chambers **(CED 53)**

Crib Retaining Wall **(CED 56)**

Facades for Cyclone Resistant Structures **(CED 57)**

Lode due to wind born debris **(CED 57)**

# THE PUBLICATION

147

<b>Volume 1 and 2</b>	<b>Comprehensive version</b>	<b>(Parts 0 to 12 – all sections included)</b>	<b>Rs. 13,760/-</b>
<b>Group 1</b>	<b>For Planning, Building/ Land Development work</b>	<b>(Parts 0, 1, 2, 3, 4, 5, 10 – Sections 1 &amp; 2 and Part 11)</b>	<b>Rs. 4,650/-</b>
<b>Group 2</b>	<b>For Structural Design</b>	<b>(Part 0, 6 – Sections 1 to 8 and Part 11)</b>	<b>Rs. 6,020/-</b>
<b>Group 3</b>	<b>For aspects relating to Construction Management, Practices and Safety and Asset and Facility Management</b>	<b>(Part 0, 7, 11 and Part 12)</b>	<b>Rs. 2,380/-</b>
<b>Group 4</b>	<b>For Building Services</b>	<b>(Part 0, 8 – Sections 1 to 6 and Part 11)</b>	<b>Rs. 4,300/-</b>
<b>Group 5</b>	<b>For Plumbing Services</b>	<b>(Part 0, 9 – Sections 1 to 4 and Part 11)</b>	<b>Rs. 2,710/-</b>

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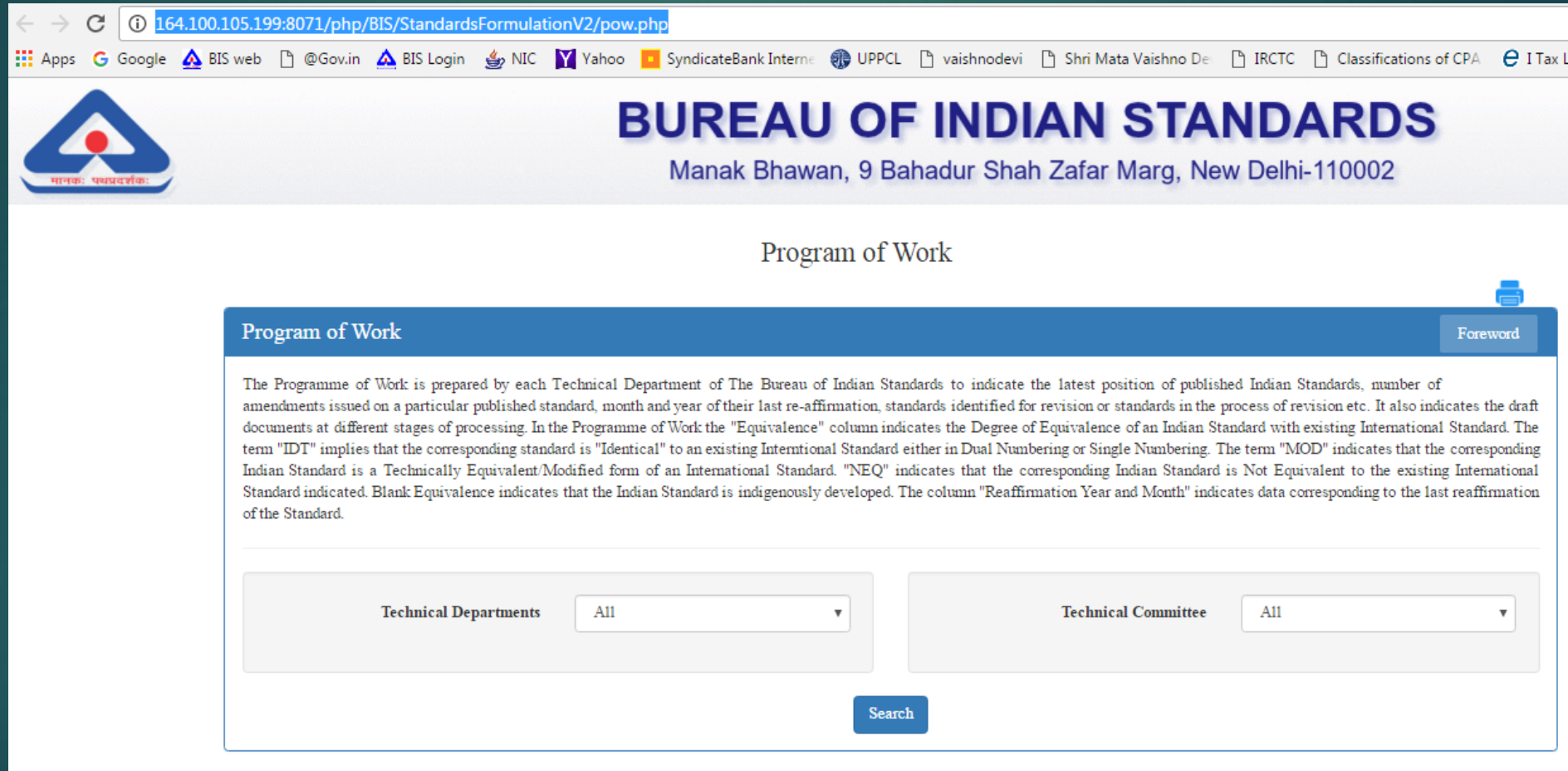
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### Program of Work

Program of Work Foreword

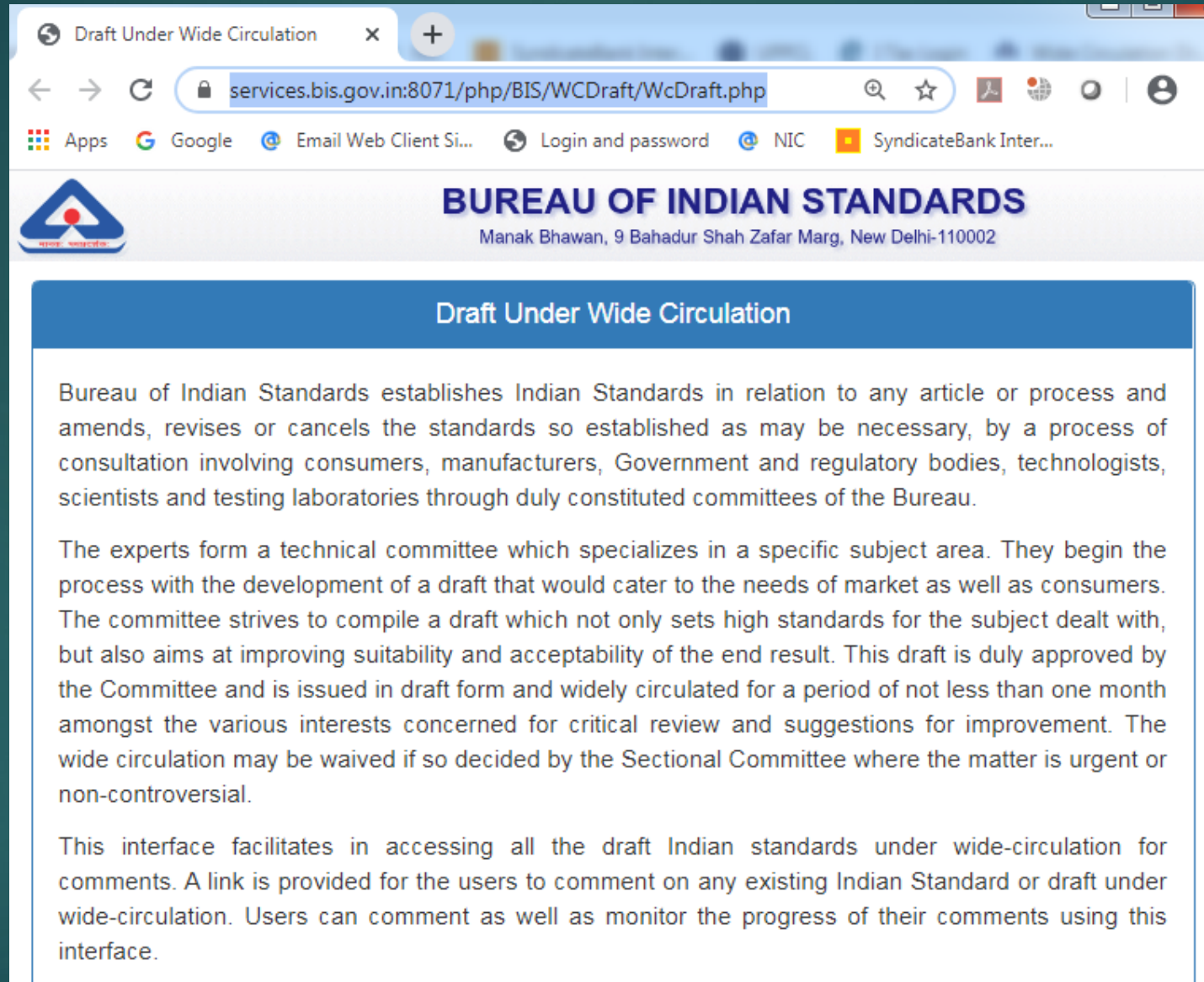
The Programme of Work is prepared by each Technical Department of The Bureau of Indian Standards to indicate the latest position of published Indian Standards, number of amendments issued on a particular published standard, month and year of their last re-affirmation, standards identified for revision or standards in the process of revision etc. It also indicates the draft documents at different stages of processing. In the Programme of Work the "Equivalence" column indicates the Degree of Equivalence of an Indian Standard with existing International Standard. The term "IDT" implies that the corresponding standard is "Identical" to an existing International Standard either in Dual Numbering or Single Numbering. The term "MOD" indicates that the corresponding Indian Standard is a Technically Equivalent/Modified form of an International Standard. "NEQ" indicates that the corresponding Indian Standard is Not Equivalent to the existing International Standard indicated. Blank Equivalence indicates that the Indian Standard is indigenously developed. The column "Reaffirmation Year and Month" indicates data corresponding to the last reaffirmation of the Standard.

Technical Departments

Technical Committee

# Draft Indian Standards for sending Comments

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The screenshot shows a web browser window with the address bar displaying [services.bis.gov.in:8071/php/BIS/WCDraft/WcDraft.php](https://services.bis.gov.in:8071/php/BIS/WCDraft/WcDraft.php). The page header features the BIS logo and the text "BUREAU OF INDIAN STANDARDS" and "Manak Bhawan, 9 Bahadur Shah Zafar Marg, New Delhi-110002". The main content area is titled "Draft Under Wide Circulation" and contains three paragraphs of text explaining the process of establishing Indian Standards and the role of technical committees.

**Draft Under Wide Circulation**

Bureau of Indian Standards establishes Indian Standards in relation to any article or process and amends, revises or cancels the standards so established as may be necessary, by a process of consultation involving consumers, manufacturers, Government and regulatory bodies, technologists, scientists and testing laboratories through duly constituted committees of the Bureau.

The experts form a technical committee which specializes in a specific subject area. They begin the process with the development of a draft that would cater to the needs of market as well as consumers. The committee strives to compile a draft which not only sets high standards for the subject dealt with, but also aims at improving suitability and acceptability of the end result. This draft is duly approved by the Committee and is issued in draft form and widely circulated for a period of not less than one month amongst the various interests concerned for critical review and suggestions for improvement. The wide circulation may be waived if so decided by the Sectional Committee where the matter is urgent or non-controversial.

This interface facilitates in accessing all the draft Indian standards under wide-circulation for comments. A link is provided for the users to comment on any existing Indian Standard or draft under wide-circulation. Users can comment as well as monitor the progress of their comments using this interface.

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# Draft Standards Open for Comments

SNo.	Document No	Title of Document	Last Date for Comments
1	<a href="#">CED 39 (15280)</a>	Guidelines for Criteria for Earthquake Resistant Design of Structures Part 6 <u>Base Isolated Buildings</u> <b>IS 1893 (Part 6)</b>	15-08-2020
2	<a href="#">CED 22 (14938)</a>	Specification for Automatic <b>Sprinkler Heads</b> for Fire Protection Service First Revision	17-08-2020
3	<a href="#">CED 3 (14859)</a>	Draft Indian Standard <b>Water efficient plumbing</b> products - Requirements: Part 2 <u>Sanitary fittings</u>	31-08-2020
4	<a href="#">CED 5 (15898)</a>	Aluminium Composite Panel Specification <b>(ACP)</b>	01-09-2020
5	<a href="#">CED 37 (16040)</a>	Code of Practice for Design Loads other than earthquake for Buildings and Structures Part 4 Snow Loads <b>IS 875 (Part 4)</b>	01-09-2020
6	<a href="#">CED 36 (16042)</a>	Glossary of Terms Associated With Fire Safety Second Revision	02-09-2020
7	<a href="#">CED 3 (14857)</a>	Draft Indian Standard <b>Water efficient plumbing</b> products Requirements: Part 1 <u>Sanitaryware</u>	04-09-2020



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