



The Institution of Engineers (India)

UP STATE CENTRE

INTRODUCTION OF CONCRETE MIX DESIGN AND ACCEPTANCE CRITERIA OF CONCRETE

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|| NABL ACCREDITED LABORATORY AS PER ISO:IEC 17025: 2017 ||

WHAT IS CONCRETE ?

Conventionally ,it is defined as a homogeneous mixture of cement ,aggregate & water.

Concrete is an essential material used in the construction of different type of structures:-

- Residential Buildings
- Highways
- Railways
- Expressways
- Metro/ Rapid Rails/ Bullet Trains
- Bridges
- Airports
- Ports/ Jetties
- Sky Scrapers
- Solar Plants/ Thermal Plants
- Dams
- Stadiums etc.





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THE HISTORY OF CONCRETE

3000 BC

Egyptian pyramids



800-400 BC

Great Wall of China



300-500 AD

Roman architecture



1903

First concrete high-rise



1956-1992

U.S. interstate highway system



1936

Hoover Dam



1824

Portland cement invented



1992

Tallest reinforced - concrete skyscraper



1963

First concrete sports dome

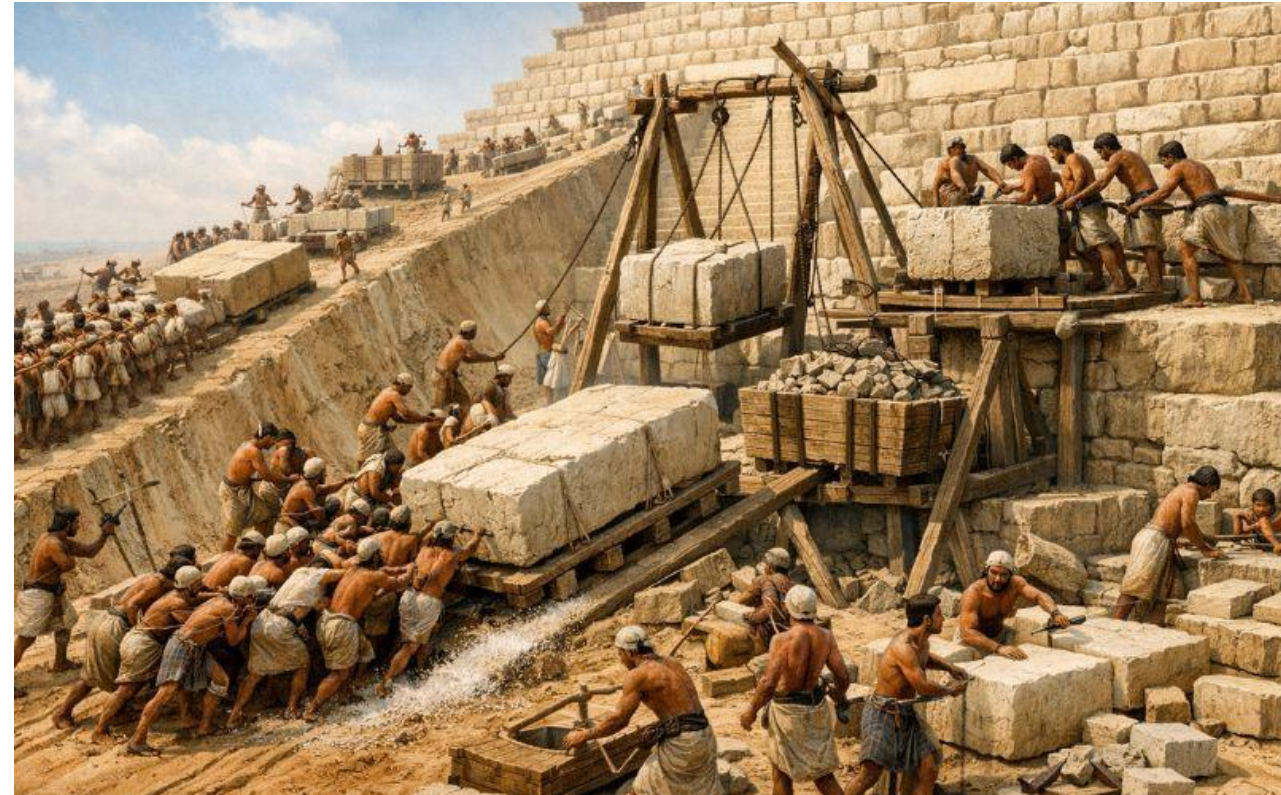


1. 3000 BC – Egyptian Pyramids

The ancient Egyptians built the pyramids using massive limestone and granite blocks.

2. 800–400 BC – Great Wall of China

Early sections of the Great Wall were constructed using **rammed earth**, stone, and bricks. Later dynasties used **lime mortar**, and in some places, **sticky rice mortar**, which significantly improved strength and durability.



03-08-2026
Location: Great Pyramid of Giza – Giza, Egypt Saqqara Pyramid – Saqqara, Egypt

3. 300–500 AD – Roman Architecture

The Romans revolutionized construction by developing **Roman concrete (Opus Caementicium)**. Their concrete was made using: Lime, Volcanic ash (Pozzolana), Water & Stone aggregates. Many Roman concrete structures have survived for over 2,000 years due to their exceptional durability.

4. 1824 – Portland Cement Invented

Joseph Aspdin, an English mason, patented **Portland Cement** in 1824. He named it because the hardened cement resembled **Portland stone** from England. This invention laid the foundation for modern concrete technology.



Colosseum – Rome, Italy • Pont du Gard Aqueduct – Vers-Pont-du-Gard, France

5. 1903 – First Concrete High-Rise

Reinforced concrete began replacing traditional masonry and steel in multistorey buildings.

One of the earliest reinforced concrete skyscrapers was the **Ingalls Building** in Cincinnati, USA (completed in 1903), proving that reinforced concrete could be used for tall buildings.

6. 1936 – Hoover Dam

The Hoover Dam is one of the world's largest mass concrete structures.

Approximately **3.25 million cubic yards (about 2.48 million m³)** of concrete were used.

It demonstrated advanced techniques in: Mass concreting

7. 1956–1992 – U.S. Interstate Highway System

Extensive use of concrete pavements transformed transportation infrastructure.

Concrete became the preferred material for: Highways, Bridges, Culverts & Pavements

This period marked the widespread adoption of concrete in infrastructure development.

8. 1963 – First Concrete Sports Dome

Large-span reinforced and prestressed concrete structures became possible.

Engineers successfully built massive stadiums and domes with minimal internal supports.

This showcased concrete's versatility for architectural and structural innovation.

9. 1992 – Tallest Reinforced Concrete Skyscraper Central Plaza in Hong Kong - 374 meters (1,227 ft)

By the early 1990s, advances in: High-strength concrete, Pumping technology, Reinforcement systems

Enabled the construction of extremely tall reinforced concrete buildings.

Since then, many skyscrapers exceeding **500–800 m** have been built using high-performance reinforced concrete, often combined with structural steel.

History of Concrete in India

Indus Valley Civilization (2600–1900 BC)

Lime mortar, gypsum mortar, and bitumen used in water-retaining structures.

Advanced drainage and urban planning.



Mohenjo-daro & Harappa ,
Currently in Pujab and at few parts
Pakistan



Dholavira, Kutch, Gujarat

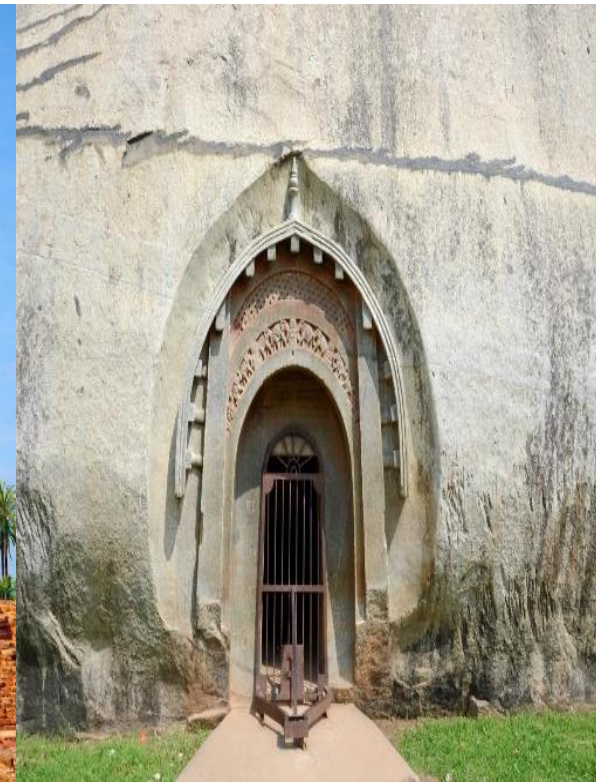
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Mauryan Period (322–185 BC)

Extensive use of lime mortar in stone construction.



Sarnath, Uttar Pradesh



Barber Caves, Bihar

History of Concrete in India

Gupta Period (320–550 AD)

Improved lime mortar and stone masonry techniques.



Deogarh – Uttar Pradesh

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Sanchi – Madhya Pradesh

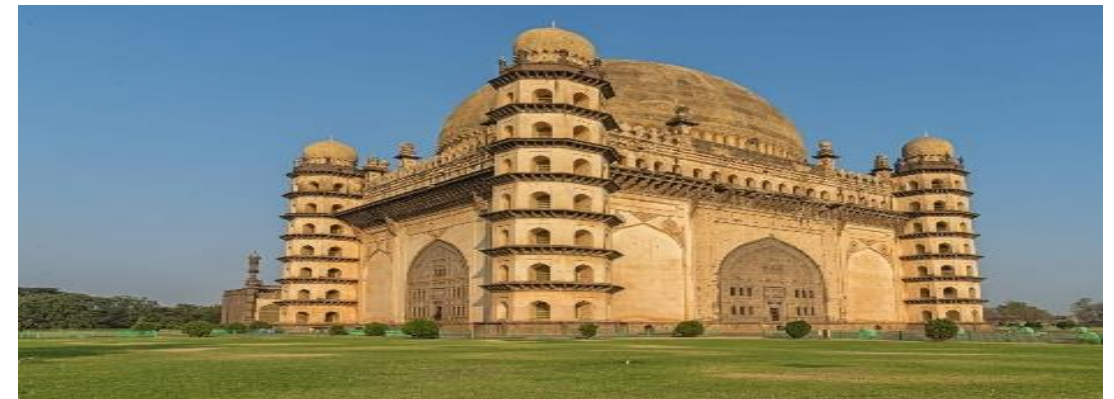
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Medieval India

Lime mortar mixed with surkhi, jaggery, bael fruit pulp, and other natural additives.



Red Fort – Delhi



Gol Gumbaz – Vijayapura (Bijapur), Karnataka

History of Concrete in India

British India – Modern Cement Industry

Introduction of Portland cement manufacturing &
Expansion of concrete use in railways, bridges, ports, and public
infrastructure

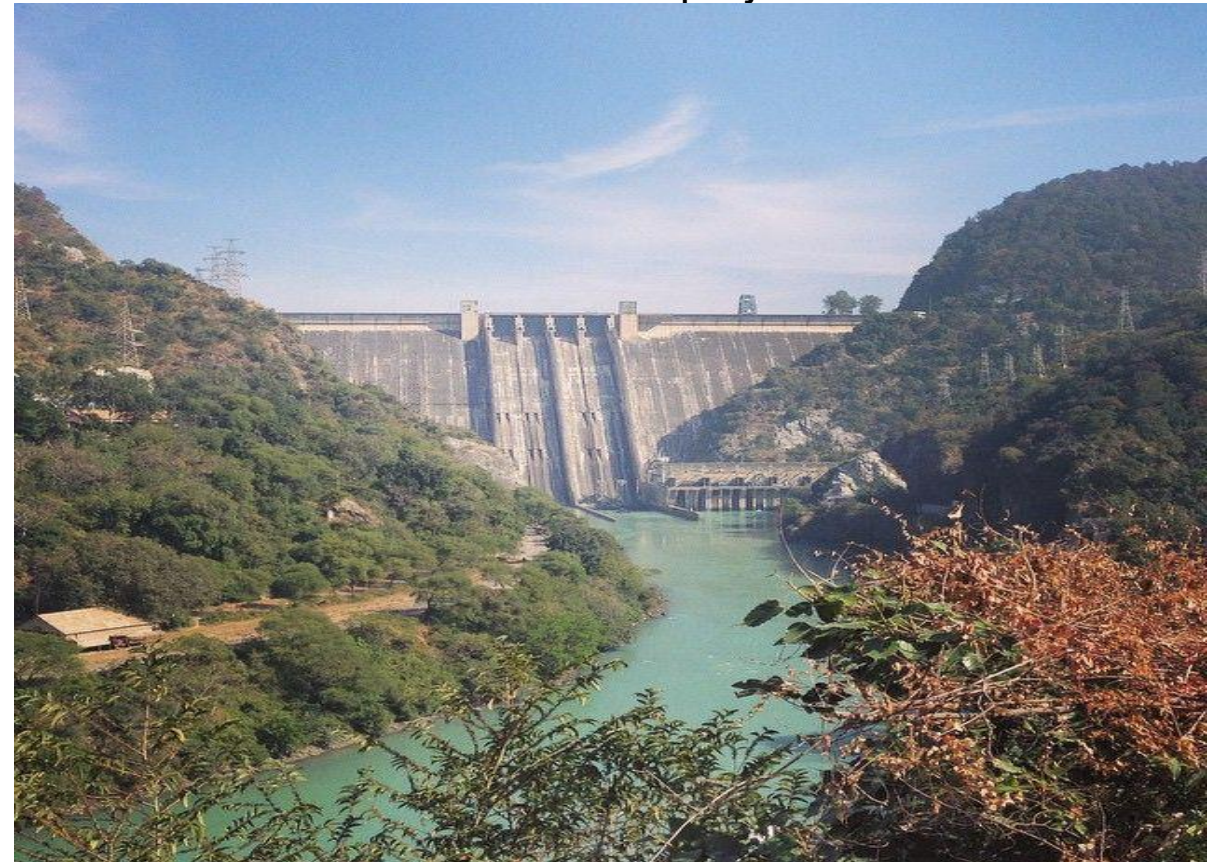


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Porbandar – Gujarat

Modern India (1947–Present)

Adoption of High-Performance Concrete (HPC), Self-Compacting Concrete (SCC), Fiber Reinforced Concrete (FRC), Roller Compacted Concrete (RCC), and Ultra-High-Performance Concrete (UHPC) in large-scale infrastructure projects.



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Bhakra Nangal Dam – Himachal Pradesh & Punjab

Composition Of Concrete :



Cement



Sand



Aggregate



Fly Ash



Admixtures



Water



CONCRETE MIX DESIGN AND ACCEPTANCE CRITERIA OF CONCRETE

- × Quality Requirements of Cement In Concrete Construction.
- × Quality Requirements of Aggregate, Admixture & Water.
- × Test on Fresh & Hardened Concrete
- × Principles of Concrete Mix Proportioning as per IS: 10262.
- × Self Compacting Concrete (SCC) & Ready-Mix Concrete (RMC).
- × Physical & Chemical Testing of Cement & Aggregate.
- × Durability of Concrete and its Acceptance Criteria as per IS: 456.
- × Non-Destructive Testing Techniques.

CEMENT

- ✗ Cement serve as a binding medium for the discrete ingredients.
- ✗ Raw material in cement mainly(major elements) consist of lime, silica, alumina & iron oxide.

Chemical composition of cement - Typical

Oxide		Cement Technology Abbreviation	% of cement clinker
SiO ₂	Silica	S	19 – 24
Al ₂ O ₃	Alumina	A	4 – 7
Fe ₂ O ₃	Ferric Oxide	F	1 – 4
CaO	Calcium oxide	C	63 – 68
MgO	Magnesium oxide	-	0.5 – 3.5
Na ₂ O + 0.658 K ₂ O	Sodium oxide Potassium oxide	(alkalis)	0.2 – 1.5



CEMENT AS PER IS:456-2000

- × Ordinary Portland Cement (IS:269).
- × Portland Pozzolana Cement (IS:1489, Part I&II).
- × Portland Slag Cement (IS:455).
- × Low Heat Portland Cement (IS:12600).
- × Sulphate Resisting Portland Cement (IS:12330).
- × Rapid Hardening Portland Cement (IS:8041).
- × Super-sulphated Cement (IS:6909).
- × Hydrophobic Cement (IS:8043).
- × High Alumina Cement (IS:6452).

METHOD OF PHYSICAL TESTS FOR HYDRAULIC CEMENT (IS:4031-1999)

IS Code

TESTS

IS:4031 (Part-I)	DETERMINATION OF FINENESS BY DRY SIEVING
IS:4031 (Part-II)	DETERMINATION OF FINENESS BY BLAINE AIR PERMEABILITY METHOD
IS:4031 (Part-III)	DETERMINATION OF SOUNDNESS
IS:4031 (Part-IV)	DETERMINATION OF CONSISTENCY OF STANDARD CEMENT PASTE
IS:4031 (Part-V)	DETERMINATION OF INITIAL AND FINAL SETTING TIMES
IS:4031 (Part-VI)	DETERMINATION OF COMPRESSIVE STRENGTH OF HYDRAULIC CEMENT OTHER THAN MASONRY CEMENT
IS:4031 (Part-VII)	DETERMINATION OF COMPRESSIVE STRENGTH OF MASONRY CEMENT
IS:4031 (Part-VIII)	DETERMINATION OF TRANSVERSE AND COMPRESSIVE STRENGTH OF PLASTIC MORTAR USING PRISM

QUALITY REQUIREMENT OF WATER , AGGREGATE & ADMIXTURE

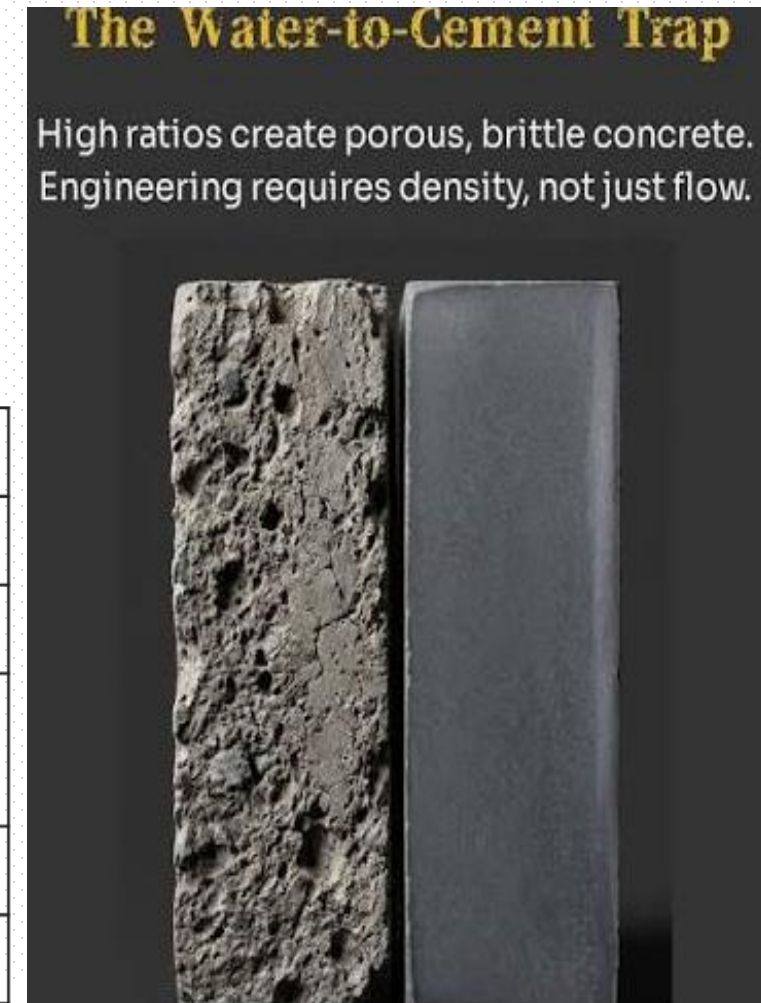
✗ Importance of water in construction:-

Water is the main component material of concrete construction which,

- Initiates hydration reaction of cement,
- Provides workability in concrete.
- Absorbs excess heat of hydration through curing.

• PERMISSIBLE LIMITS FOR WATER IS:456-2000

Organic	200 mg/l
Inorganic	3000 mg/l
Sulphates(As SO ₃)	400 mg/l
Chlorides(As Cl)	2000 mg/l for PCC 500 mg/l for RCC
Suspended matter	2000
pH 03-08-2026	≥6 ASLPL



Aggregates :

- **Coarse and Fine aggregates** make up the bulk of a concrete mixture.

- **Coarse aggregates:**

Aggregate most of which is retained on 4.75mm IS sieve ,for most of work,20mm aggregate is suitable. Where there is no restriction to the flow of concrete into section, 40mm or large size may be permitted.

- **Fine aggregates:**

Aggregate most of which is passes from 4.75mm IS sieve and containing only so much coarser material as permitted in clause 6.3 of IS:383-2016



Coarse Aggregate
Fine Aggregate



Methods of Test for Aggregates for Concrete

Standard Codes	Tests
IS : 2386 (Part I)	Particle Size and Shape
IS : 2386 (Part II)	Estimation of Deleterious Material and Organic Impurities
IS : 2386 (Part III)	Specific Gravity .Density, Voids, Absorption and Bulking
IS : 2386 (Part IV)	Mechanical Properties
IS : 2386 (Part V)	Soundness
IS : 2386 (Part VI)	Measuring Mortar Making Properties of Fine Aggregate
IS : 2386 (Part VII)	Alkali Aggregate Reactivity
IS : 2386 (Part VIII)	Petrographic Examination
IS : 383	Coarse and Fine Aggregate for Concrete - Specification
Ministry of Road Transport & Highway	Specification For Road And Bridge Works

Manufactured Coarse/Fine Aggregates

Extent of utilization (As Per IS:383-2016)

Type of Aggregate	Maximum Utilization		
	Plain Concrete (%)	Reinforced Concrete (%)	Lean Concrete (Less than M15 Grade (%))
Coarse / Fine Aggregate			
a) Iron Slag Aggregate	50	25	100
b) Steel Slag Aggregate	25	NIL	100
c) Recycled Concrete Aggregate (RCA)	25	20 (Only up to M25 Grade)	100
d) Recycled Aggregate (RA) *Only in Coarse Aggregate	NIL	NIL	100
e) Bottom Ash from Thermal Power Plant *Only in Coarse Aggregate	NIL	NIL	25
f) Copper Slag Aggregate *Only in Fine Aggregate	40	35	50

Admixtures

Chemical Admixture (As per IS:9103-1999)

- Accelerating
- Retarding
- Air-Entraining
- Water-Reducing or Plasticizing
- High Range Water-Reducing or Super

Plasticizing

Normal Type

Retarding Type

Mineral Admixture (As per IS:456-2000)

- Pozzolanas
 - Fly ash
 - Silica Fume
 - Rice Husk Ash
 - Metakaolin
- Ground Granulated Blast Furnace Slag (GGBFC)

Mineral Admixture

Mineral admixtures are finely divided natural or industrial by-products added to concrete along with cement. They are used to partially replace cement and improve the properties of fresh and hardened concrete.

Pozzolanas

A pozzolana is a siliceous or siliceous-aluminous material that does not have cementing properties by itself, but when mixed with water and calcium hydroxide (lime) released during cement hydration, it forms cement-like compounds. Type - Natural Pozzolanas & Artificial Pozzolanas

Fly Ash

Fly ash is a fine powder collected from the exhaust gases of coal-fired thermal power plants.

Silica Fume

Silica fume is an extremely fine powder obtained as a by-product during the manufacture of silicon metal or ferrosilicon alloys.

Rice Husk Ash (RHA)

Rice Husk Ash is obtained by burning rice husk under controlled conditions .

Metakaolin

Metakaolin is produced by heating purified kaolin clay at about 650–800°C.

Ground Granulated Blast Furnace Slag (GGBFS)

Ground Granulated Blast Furnace Slag (GGBFS) is obtained by rapidly cooling molten slag produced during iron manufacturing in a blast furnace. The cooled slag is then dried and ground into a fine powder.

Chemical Admixture

A chemical admixture is a material added to concrete before or during mixing in a small quantity to improve the properties of fresh or hardened concrete.

Accelerating Admixture

An accelerating admixture speeds up the setting and hardening of concrete. It helps concrete gain strength faster.

Retarding Admixture

A retarding admixture slows down the setting of concrete.

Water-Reducing (Plasticizing) Admixture

A water-reducing (plasticizing) admixture reduces the amount of water needed while maintaining the same workability.

High Range Water-Reducing (Super plasticizing) Admixture

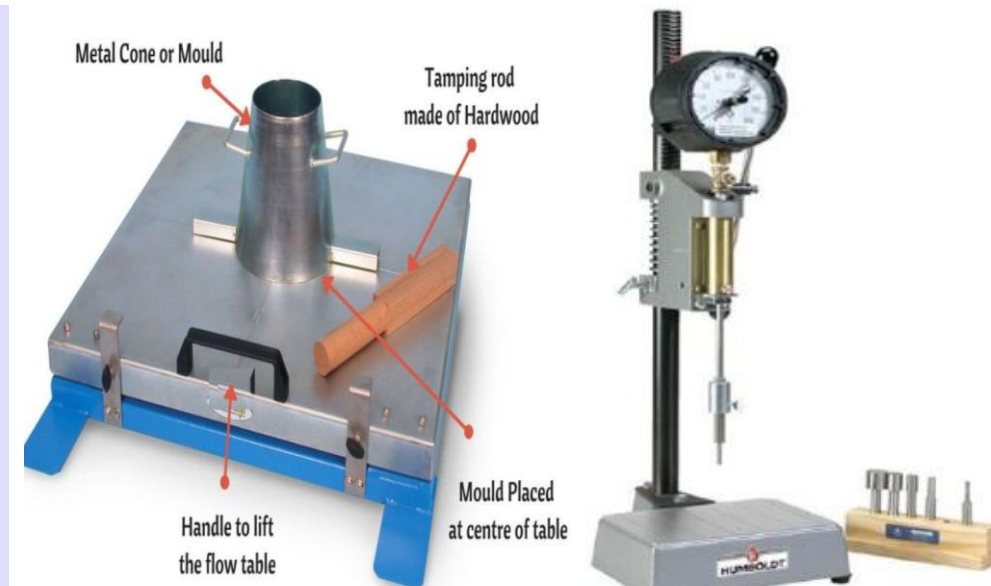
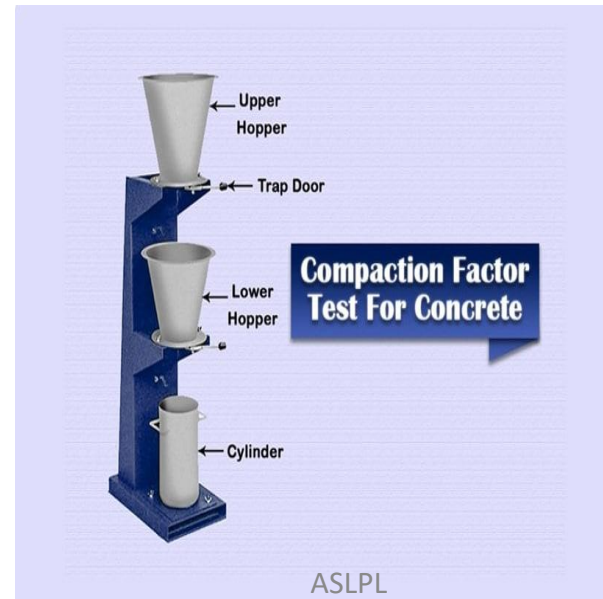
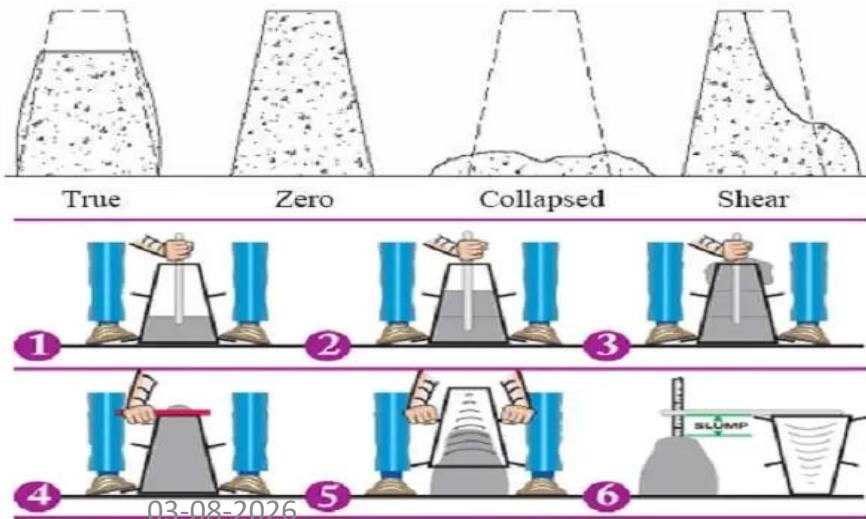
A superplasticizer greatly reduces the amount of water needed or provides very high workability (flowing concrete).

Chemical admixtures (which are added in small amounts), mineral admixtures are used in larger quantities (10–70% of cement).

Tests on Fresh/Hardened Concrete

Fresh Concrete	Hardened Concrete
Workability Test as per IS:1199	Compressive Strength as per IS:516
Air Content as per IS:1199	Flexural Strength as per IS:516
Setting Time as per IS:1199	Modulus of Elasticity as per IS:516
Bleeding as per IS:1199	Split Tensile Strength as per IS:516
Cement Content as per IS:1199	NDT Tests

Workability Test :- IS:6461 Part VII-1973 Defines workability as that property of freshly mixed concrete or mortar which determines the ease and homogeneity with which it can be mixed, placed, compacted and finished.



Principles of Concrete Mix Proportioning as per IS: 10262.

- Concrete is composed principle of cement,aggregates,water and may contain other cementitious materials and/or chemical admixture.
- It will contain some amount of entrapped air and may also contain purposely entrained air obtained by use of admixture or air entraining admixture.
- The selection of concrete proportions involves a balance between requirements of placeability, strength , durability, density, appearance and economy.

Principles of Concrete Mix Proportioning as per IS: 10262.

Principle	Purpose
Strength	Achieve the required compressive strength
Durability	Resist weathering, chemicals, and corrosion
Workability	Ensure easy mixing, placing, and compaction
Water-Cement Ratio	Control strength and durability
Cement Content	Provide adequate strength without excess cost
Aggregate Selection	Improve strength, economy, and durability
Water Content	Provide hydration and workability
Admixtures	Improve concrete properties
Economy	Reduce cost while maintaining quality
Quality Control	Ensure consistent concrete production

Self Compacting Concrete(SCC) & Ready-Mix Concrete(RMC)

Self-Compacting Concrete (SCC)

Self-Compacting Concrete (SCC) is a highly flowable concrete that can flow under its own weight, completely fill the formwork, pass through congested reinforcement, and achieve full compaction without vibration.

Advantages	Applications
No vibration required.	High-rise buildings
Better surface finish.	Bridges
Faster construction.	Precast concrete
Suitable for heavily reinforced sections.	Complex structural members
Reduced labour and noise.	Nuclear structures
Higher durability.	Tunnel linings



Self Compacting Concrete(SCC) & Ready-Mix Concrete(RMC)

Ready-Mix Concrete (RMC)

Ready-Mix Concrete (RMC) is concrete manufactured in a batching plant according to a specified mix design and delivered to the construction site in a transit mixer ready for placement.

Advantages	Applications
Uniform quality.	Residential buildings
Faster construction.	Commercial complexes
Reduced material wastage.	Highways
Lower labour requirement.	Bridges , Dams
Better durability.	Metro rail projects
Environment-friendly.	Industrial structures



Physical & Chemical Testing of Cement & Aggregate

Physical Property of Cement		
Property	Test Method	Specification (Indian Standard)
Fineness	IS 4031 (Part 1 & 2)	Residue on 90 µm sieve ≤ 10% (OPC) or Blaine fineness as specified
Standard Consistency	IS 4031 (Part 4)	Normally 26–33% water (varies with cement type)
Initial Setting Time	IS 4031 (Part 5)	Not less than 30 min
Final Setting Time	IS 4031 (Part 5)	Not more than 600 min (10 h)
Soundness (Le Chatelier)	IS 4031 (Part 3)	Expansion ≤ 10 mm
Compressive Strength	IS 4031 (Part 6)	As per cement grade (33, 43 or 53 MPa)
Specific Gravity	IS 4031 (Part 11)	Approximately 3.15
Density	IS 4031 (Part 11)	About 1440 kg/m ³ (bulk), 3150 kg/m ³ (absolute)

Chemical Property of Cement		
Property	Test Method	Specification
Loss on Ignition (LOI)	IS 4032	≤ 5% (typical OPC requirement)
Insoluble Residue		As per relevant cement specification
Magnesium Oxide (MgO)		≤ 6%
Sulphur Trioxide (SO ₃)		≤ 3–3.5% (depends on cement grade)
Chloride Content		≤ 0.1% for OPC
Alkali Content		Checked where alkali–aggregate reaction is a concern

Physical & Chemical Testing of Cement & Aggregate

Physical Testing of Fine and Coarse Aggregates		
Property	Test Method	Typical Requirement
Sieve Analysis (Grading)	IS 2386 Part 1	Must conform to IS 383 grading limits
Flakiness Index	IS 2386 Part 1	Preferably <30%
Elongation Index	IS 2386 Part 1	Preferably <30%
Combined Flakiness & Elongation	IS 2386 Part 1	Usually ≤35%
Specific Gravity	IS 2386 Part 3	2.60–2.80
Water Absorption	IS 2386 Part 3	Preferably <2%
Bulk Density	IS 2386 Part 3	Determined for mix calculations
Bulking of Sand	IS 2386 Part 3	Determined for moisture correction
Moisture Content	IS 2386 Part 3	Used to adjust mixing water
Aggregate Crushing Value	IS 2386 Part 4	≤30% (wearing surfaces), ≤45% (other concrete)
Aggregate Impact Value	IS 2386 Part 4	≤30% (wearing surfaces), ≤45% (other work)
Los Angeles Abrasion Value	IS 2386 Part 4	≤30–50% depending on application

Physical & Chemical Testing of Cement & Aggregate

Chemical Testing of Aggregates		
Property	Test Method	Typical Requirement
Organic Impurities	IS : 2386 (Part II)	Shall be within permissible limits
Clay Lumps & Friable Particles		Within IS 383 limits
Coal & Lignite		Within IS 383 limits
Chloride Content		Within durability limits
Sulphate Content		Within durability limits
Alkali–Aggregate Reactivity	IS : 2386 (Part VII)	Should be non-reactive where applicable

Durability of Concrete and its Acceptance Criteria as per IS 456:2000

- Durability is the ability of concrete to withstand weathering, chemical attack, abrasion, and other deterioration processes while maintaining its required strength and serviceability throughout its intended service life. IS 456:2000 emphasizes that durable concrete depends on proper material selection, mix design, workmanship, curing, and adequate concrete cover.

Factors Affecting Durability (IS 456:2000)	Environmental exposure conditions
	Water-cement (w/c) ratio
	Minimum cement content
	Grade of concrete
	Quality of aggregates and cement
	Adequate compaction
	Proper curing
	Crack control and workmanship

Durability of Concrete and its Acceptance Criteria as per is:456:2000

Exposure Condition	Minimum Grade of Concrete	Maximum Free W/C Ratio	Minimum Cement Content (kg/m ³)	Nominal Cover (mm)
Mild	M20	0.55	300	20
Moderate	M25	0.50	300	30
Severe	M30	0.45	320	45
Very Severe	M35	0.45	340	50
Extreme	M40	0.40	360	75

- Values are for reinforced concrete with 20 mm nominal maximum aggregate size
- For reinforcement up to 12 mm diameter in mild exposure, the cover may be reduced by 5 mm.
- For M35 and above concrete in severe and very severe exposure, the cover may be reduced by 5 mm where permitted by the code.

Importance of Durability	Protects reinforcement against corrosion
	Improves service life of RCC structures
	Reduces maintenance and repair costs.
	Enhances resistance to chemical attack, abrasion, and freeze-thaw effects (where applicable).
	Ensures structural safety and long-term performance

Major Changes: IS 456:2000 vs Draft IS 456 (2025)

IS 456:2000	Draft IS 456 (2025)
Plain & Reinforced Concrete	Structural Concrete
RC only	RC + Prestressed + Composite Concrete
Prescriptive durability	Performance-based durability
Limited special concretes	Includes HPC, SCC, FRC, Lightweight Concrete, Roller Compacted Concrete, etc.
Limited sustainability provisions	Greater emphasis on low-carbon and sustainable materials
Two design limit states	Expanded performance criteria including durability and service life

IS 456:2000 Clause / Chapter	Current Provision (IS 456:2000)	Proposed Change in Draft Fifth Revision	Practical Impact
Title	Plain and Reinforced Concrete – Code of Practice	Renamed Structural Concrete – Code of Practice	Broader applicability to modern concrete structures.
Scope (Clause 1)	Plain and Reinforced Concrete	Scope expanded to include prestressed concrete, composite construction, HPC, SCC, FRC, lightweight concrete, RCC (roller compacted concrete), alkali-activated concrete, etc.	One unified concrete code replacing multiple separate provisions.
References (Clause 2)	References limited to codes existing in 2000	Updated references to latest BIS standards	Better alignment with revised material and testing standards.
Terminology (Clause 3)	Conventional concrete terminology	Numerous new definitions (service life, robustness, sustainability, performance-based durability, etc.)	Standardized modern terminology.
Materials (Chapter 5)	OPC, PPC, PSC, conventional SCMs	Greater recognition of SCMs, blended binders, new admixtures, recycled materials	Increased flexibility in material selection and sustainability.
Grades of Concrete	M10 to M80	Extended range up to higher strength classes (draft provisions)	Suitable for tall buildings and infrastructure.
Durability (Section 8)	Prescriptive limits (cement content, w/c ratio, cover)	Performance-based durability, chloride ingress, carbonation, service-life verification	Durability becomes a measurable performance requirement rather than only prescriptive compliance.
Service Life	Not explicitly defined	Explicit service-life design philosophy (e.g., different target service lives for different structures)	Designers must demonstrate durability over the intended life.
Mix Design	Refers to IS 10262; strength-oriented	Stronger emphasis on durability-oriented and performance-based mix design	More laboratory testing and validation expected.

IS 456:2000 Clause / Chapter	Current Provision (IS 456:2000)	Proposed Change in Draft Fifth Revision	Practical Impact
Limit State Design	Two limit states: Collapse and Serviceability	Expanded framework including durability, robustness, integrity and related performance criteria (draft)	Design philosophy broadens beyond strength alone.
Structural Analysis	Conventional methods	Updated provisions for advanced analysis and modelling	Better suited to complex structures.
Reinforcement	Conventional detailing	Revised detailing and development-length provisions in several areas	Improved constructability and seismic performance (subject to final draft).
Prestressed Concrete	Covered separately in IS 1343	Proposed integration into IS 456	Single code for reinforced and prestressed concrete.
Composite Structures	Not covered	New chapter proposed	Unified guidance for steel-concrete composite systems.
Special Concretes	Very limited guidance	Dedicated provisions for SCC, FRC, HPC, lightweight and other modern concretes	Formal recognition of contemporary construction materials.
Acceptance Criteria (Clause 16)	Acceptance based mainly on cube strength statistics	Strength acceptance retained, with stronger emphasis on QA/QC, documentation and durability performance	Quality management becomes more comprehensive.
Quality Control	Statistical quality control	Greater emphasis on QA systems, traceability and documentation	More rigorous site quality assurance.
Cover to Reinforcement	Prescriptive nominal cover	Cover linked more closely to service life and exposure	Optimized durability-based cover design.
Curing	Conventional curing requirements	More detailed curing guidance for modern concrete technologies	Improved long-term performance.
03-08-2026 Sustainability	Not specifically addressed	ASLPI New provisions encouraging low-carbon and sustainable construction	Supports environmental objectives.

Existing IS 2386 Series (1963, Reaffirmed 2021)

Part	Title	Major Tests Covered
IS 2386 (Part 1)	Particle Size and Shape	Sieve analysis, material finer than 75 µm, flakiness index, elongation index, angularity number
IS 2386 (Part 2)	Deleterious Materials and Organic Impurities	Clay lumps, coal & lignite, lightweight pieces, soft particles, organic impurities, deleterious materials
IS 2386 (Part 3)	Specific Gravity, Density, Voids, Absorption and Bulking	Specific gravity, water absorption, bulk density, voids, bulking of sand
IS 2386 (Part 4)	Mechanical Properties	Aggregate crushing value (ACV), 10% fines value, aggregate impact value (AIV), Los Angeles abrasion value, polished stone value, crushing strength
IS 2386 (Part 5)	Soundness	Sodium sulphate and magnesium sulphate soundness tests
IS 2386 (Part 6)	Measuring Mortar Making Properties of Fine Aggregate	Mortar strength tests for fine aggregate
IS 2386 (Part 7)	Alkali Aggregate Reactivity	Potential alkali–aggregate reaction tests
IS 2386 (Part 8)	Petrographic Examination	Petrographic examination of aggregates and rocks

Part 1 – Determination of Physical Properties

Tests Included

1. Specific Gravity
2. Water Absorption
3. Bulk Density
4. Percentage of Voids
5. Sieve Analysis
6. Fineness Modulus
7. Material Finer than 75 µm
8. Sand Equivalent Value
9. Methylene Blue Value
10. Flakiness Index
11. Elongation Index
12. Combined Flakiness & Elongation Index
13. Shell Content
14. Shale Content
15. Clay Lumps
16. Clay, Fine Silt & Fine Dust (Sedimentation Method)
17. Coal & Lignite (Lightweight Pieces)
18. Soft Particles
19. Organic Impurities
20. Angularity Number
21. Bulking of Fine Aggregate (Field Method)
22. Surface Moisture in Fine Aggregate
23. (Field Method)
24. Mortar Making Properties of Fine Aggregate

Part 2-Determination of Mechanical Properties

Tests Included

1. Aggregate Abrasion Value (Los Angeles Machine)
2. Micro-Deval Coefficient
3. Aggregate Crushing Value (ACV)
4. Ten Percent Fines Value (TFV)
5. Aggregate Impact Value (AIV)
6. Polished Stone Value (PSV)
7. Aggregate Surface Abrasion Value
8. Crushing Strength

Proposed Future Structure of Revised IS 2386 Series

Draft Part	Scope
Part 3	Determination of Durability Properties
Part 4	Determination of Chemical Properties and Hazardous Substances
Part 5	Guidelines for Petrographic Examination of Aggregates for Concrete

TALLEST BUILDINGS IN LUCKNOW

— TILL CURRENT DATE (2026) —

A Skyline of Progress, A Symbol of New Lucknow



RANK	BUILDING	APPROX. HEIGHT	FLOORS	STATUS
1	Prestigia	155.5 m	—	Under Construction
2	Shalimar One World Iconic Tower	120 m	30 Floors	Under Construction
3	JP Convention Center	90 m	16 Floors	Completed
4	Shalimar Titanium	85 m (Approx.)	—	Residential
5	Omaxe The Palace	80 m (Approx.)	—	Residential
6	Experion Capital	80 m (Approx.)	—	Residential / Commercial
7	Rishita Manhattan Towers	75 m (Approx.)	—	Residential
8	Paarth Republic High Rise	72 m (Approx.)	—	Residential
9	MI Rustle Court Towers	70 m (Approx.)	—	Residential
10	LDA Narmada Apartments	—	29 Floors	Under Construction



Thank you

ESSENTIAL HEROS



|| GEOTECH INVESTIGATION || NON DESTRUCTIVE TESTING || BUILDING MATERIAL TESTING || ENGINEERING SURVEY ||

ARUN SOIL LAB PRIVATE LIMITED

(Geotech & Building Material Consultant For Civil Engineering Projects)

|| NABL ACCREDITED LABORATORY AS PER ISO:IEC 17025: 2017 ||

