Introduction to Masonry, Painting, Timber structure, Glass in Building

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Masonry

A construction technique involves the building of structures using individual units laid in a specific pattern and bound together by mortar.

These units, traditionally made of materials like brick, stone, or concrete blocks, are stacked and arranged to create walls, columns, arches, and other architectural elements.

BRICKS MASONSRY

STONE MASONRY

CEMENT BLOCKS MASONRY

Masonry: Components

A combination of bricks/ stone/cement blocks etc. with mortar, and workmanship to create structures.

Brick + Mortar + Workmanship = Bricks Masonry




Masonry

Use of stone masonry work is known and practised froth the earlier days and natural stone is extensively available in many parts of this country.

The types of stone masonry construction followed depends on local factors like physical characteristics of the stone, climatic conditions, workmanship, etc.

Certain broad principles in laying, bonding, breaking of joints and finish should be complied with in order that the masonry develops adequate strength and presents a neat appearance.

Masonry

Choice of masonry units is generally made from the consideration of:

- **local availability,**
- **compressive strength,**
- **durability,**
- **cost, and**
- **ease of construction.**

- **Brick has the advantage over stone that it lends itself to easy construction and requires less labour for laying. Stone masonry, because of practical limitations of dressing to shape and size, usually has to be thicker and results in unnecessary extra cost. Thus, the first choice for a building at any place, would be brick, if it is available at reasonable cost with requisite strength and good quality. I**

Masonry

- Decoding the Durability Factor in Masonry Materials
- Utility and Functionality: Masonry Material for Every Purpose
- Longevity and Maintenance: Masonry's Lifespan Matters
- Considering the Resale Value: How Masonry Affects Your Home's Worth

"Choosing the right masonry material can make all the difference in your project. It is not just about aesthetics, it is about durability and long-term maintenance."

Masonry

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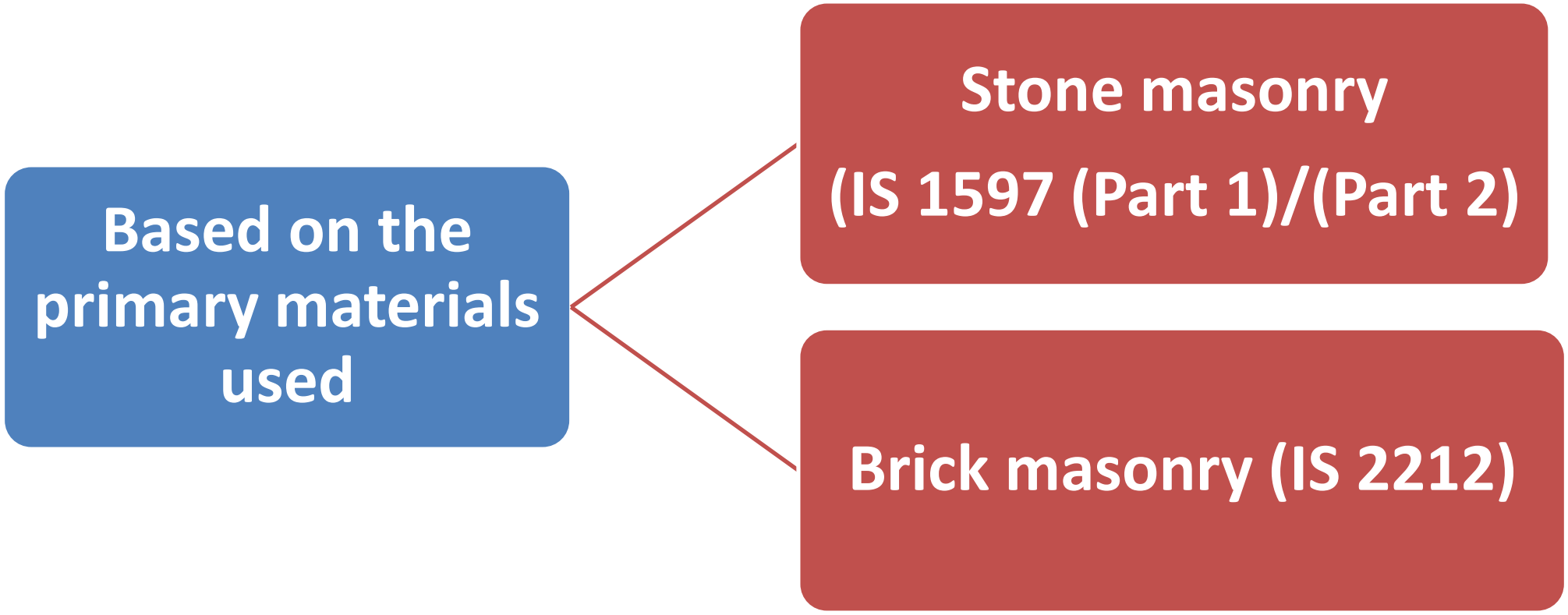
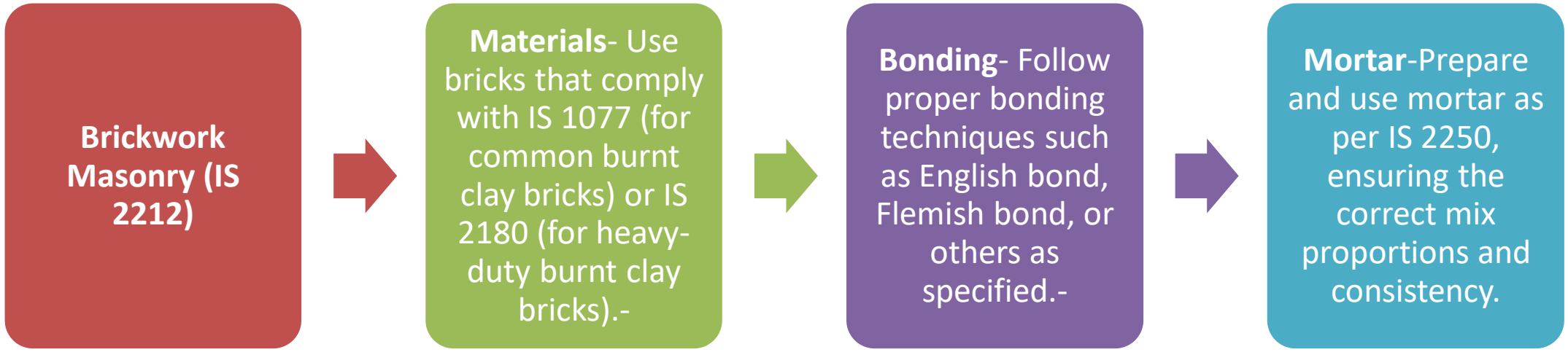
Thus, the first choice for a building at any place, would be brick, if it is available at reasonable cost with requisite strength and good quality.

Masonry: Classification



Masonry: Relevant Indian Standards

1. **Design and Structural Use of Masonry (IS 1905)** - Ensure that the design of masonry elements like walls and columns considers the load-bearing capacity as specified in IS 1905
2. **IS 2212:1991** - **Code of Practice for Brickwork:** Provides guidelines on construction practices for brickwork in buildings, covering aspects like bonding patterns, jointing techniques, plastering, curing, and other relevant construction practices.



Common bonding patterns: IS 2212:1991

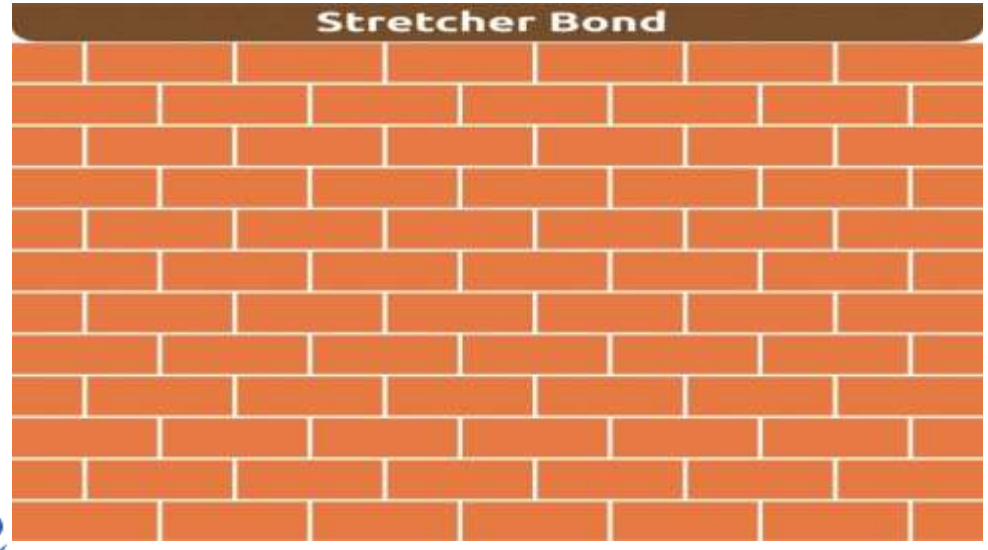
- Stretcher bond
- Header bond
- English bond
- Single Flemish bond
- Double Flemish bond
- English Garden Wall bonds
- Flemish Garden Wall bonds
- Dutch bond
- Raking bond Herring bone bond Diagonal bond

1. Stretcher Bond

Description: In stretcher bond, all bricks are laid as stretchers (long sides of bricks) in each course.

Usage: Suitable for walls that are one brick thick (typically 90 mm) and where appearance is not a primary concern.

Advantages: Simplest and most economical bond pattern;

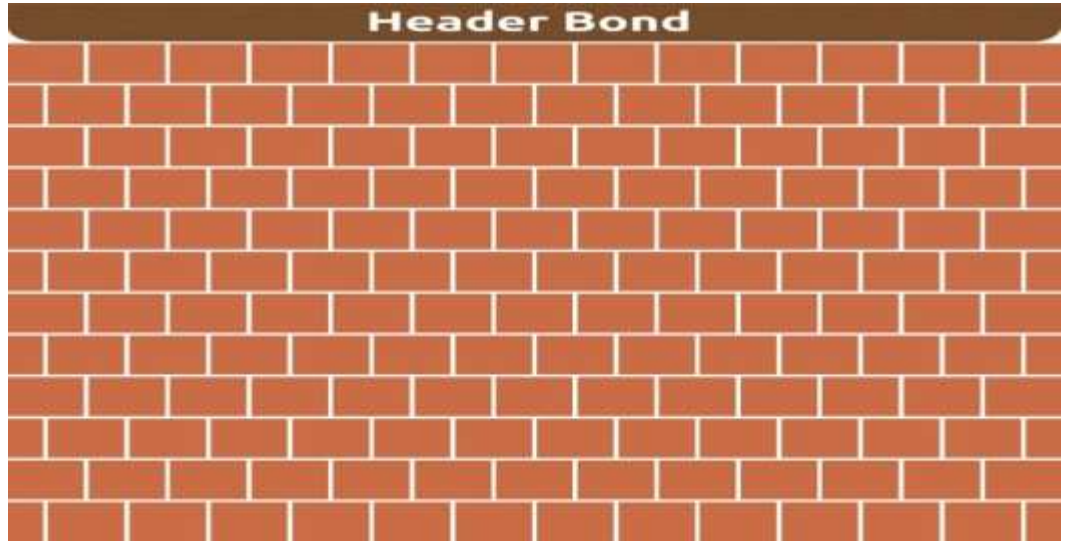


2. Header Bond

Description: In header bond, all bricks are laid as headers (short sides of bricks) in each course.

Usage: Often used in thicker walls (more than one brick thick) or where additional strength is required.

Advantages: Provides better strength and bonding compared to stretcher bond.

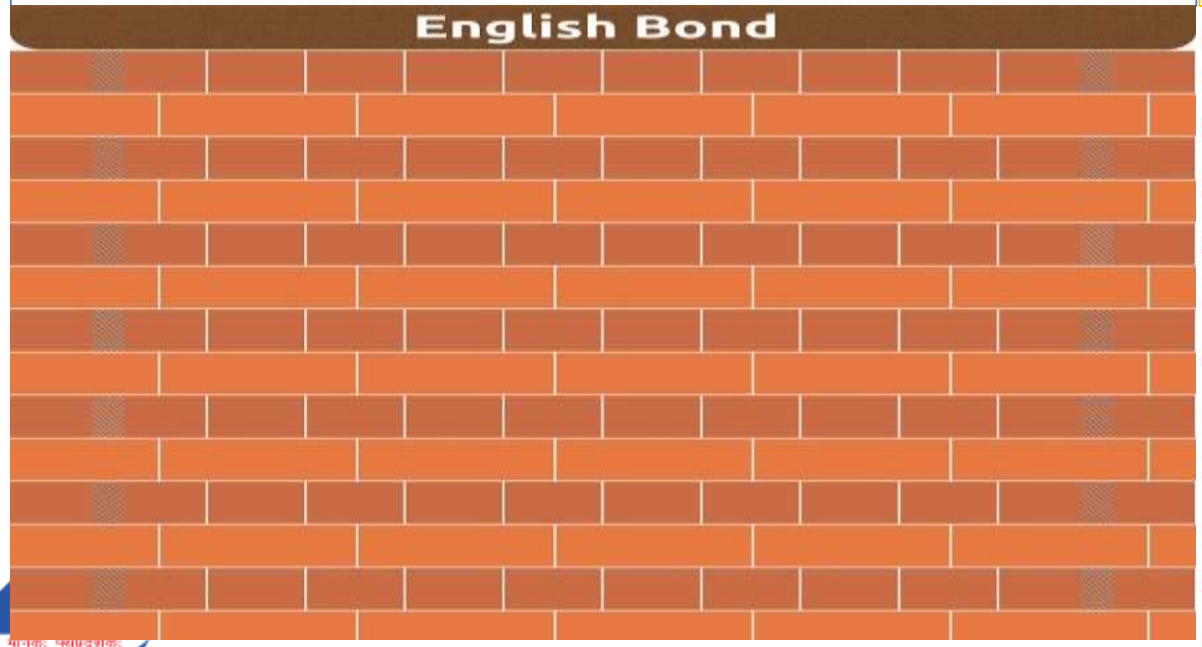


3. English Bond

Description: **Alternates courses** of **stretchers and headers.** Every alternate course starts with a header at the corner.

Usage: Provides good appearance and structural strength, commonly used in load-bearing walls.

Advantages: Distributes loads evenly; offers a uniform and pleasing pattern.

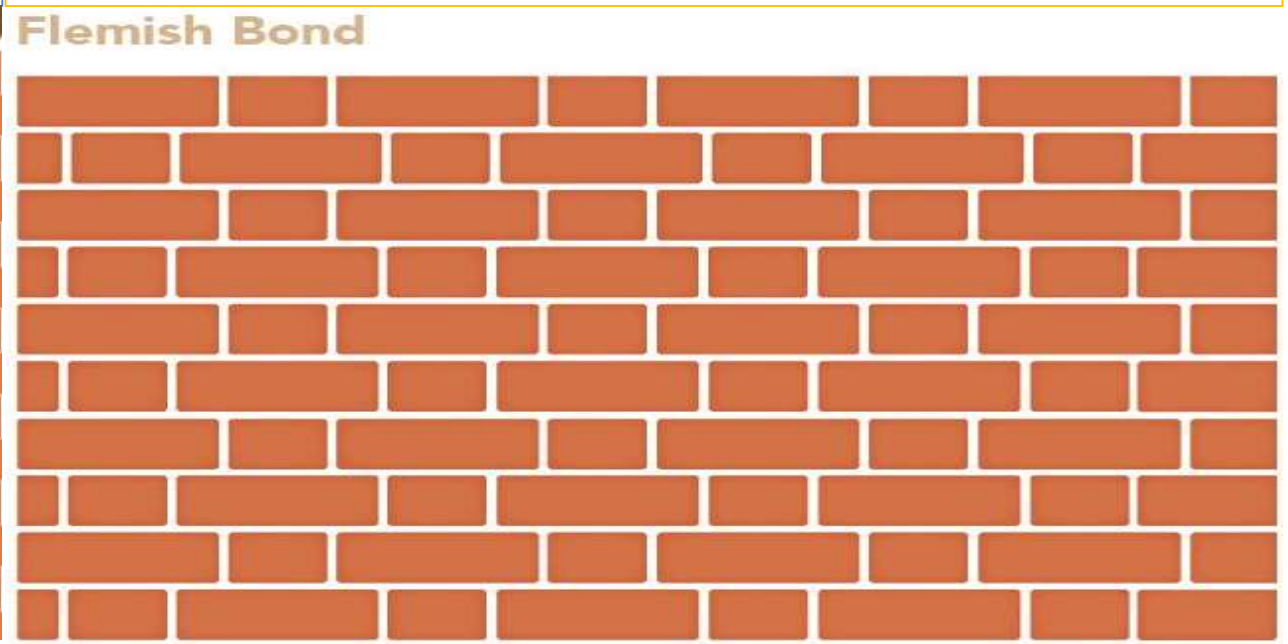


4. Flemish Bond

Description: Alternates **headers and stretchers** within the **same course**, creating a checkerboard pattern.

Usage: Provides a decorative appearance and is suitable for both load-bearing and non-load-bearing walls.

Advantages: Offers good bonding and aesthetics; requires skilled craftsmanship.



5. English Garden Wall Bond:

Description: The English Garden Wall bond is a decorative variation of the traditional English bond. Typically, it alternates courses of three stretchers followed by one header. This pattern repeats throughout the wall.

6. Flemish Garden Wall Bond:

Description: The Flemish Garden Wall bond is a decorative variant of the traditional Flemish bond.

Alternates courses of headers and stretchers in a more regular pattern compared to the English Garden Wall bond.

7. Rat Trap Bond

Description: Involves placing bricks on edge (like headers) with the wall thickness being equal to the length of the brick.

Usage: Provides thermal insulation and reduces material usage, suitable for non-load-bearing walls.

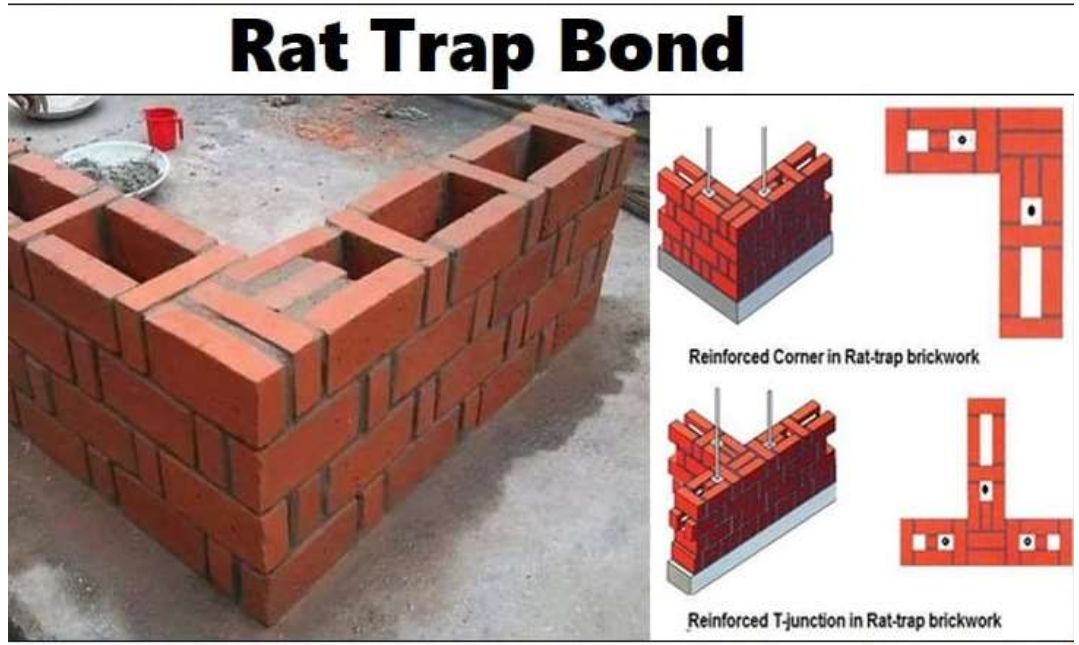
8. Dutch Bond

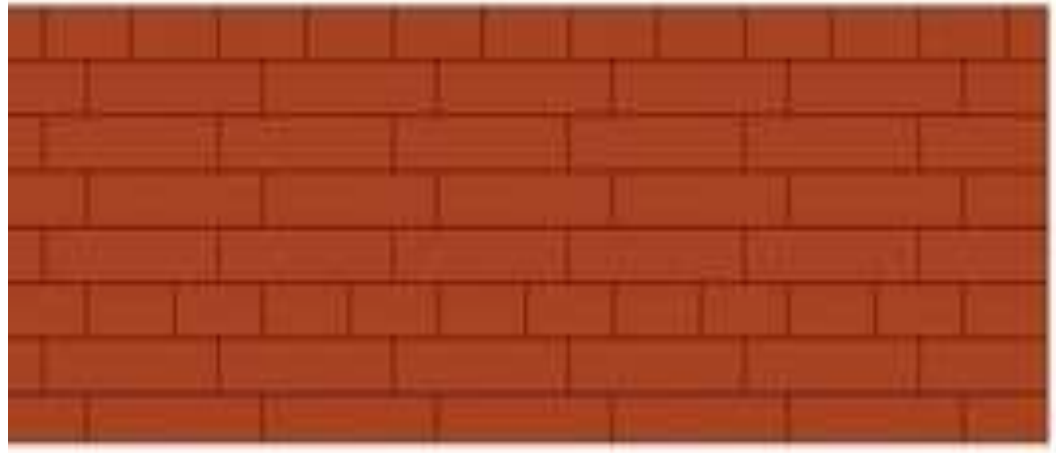
Dutch bond consists of alternating courses of headers and stretchers. In each course:

One stretcher is followed by one header.

The headers are centered over the stretchers in the course below.

This creates a staggered pattern where each header is centered over the joint between two stretchers in the course below.





Dutch Bond

Important Standards

- Mortar Preparation and Use (IS 2250)
- Concrete Masonry Units (IS 2185)- Use concrete blocks that meet the specifications for hollow and solid concrete masonry units as per IS 2185
- Hollow and Solid Concrete Block Masonry (IS 2572)
- Stone Masonry (IS 1597)
- Autoclaved Cellular Concrete Block Masonry (IS 6041)
- Testing of Masonry Units (IS 3495): Conduct tests to determine the physical and mechanical properties of burnt clay bricks and other masonry units

Important Standards

IS 1077:1992 - Common Burnt Clay Building Bricks – Specification- It covers dimensions, physical properties, and classification of bricks based on their compressive strength.

IS 1905:1987 - Code of Practice for Structural Use of Unreinforced Masonry

IS 4326:1993 - Code of Practice for Earthquake Resistant Design and Construction of Buildings

IS 6041:1985 - Specification for Structural Design of Load-bearing Brickwork

Stone masonry

Involves detailing the selection of materials, preparation, construction practices, and quality control measures.

IS 1597 (Part 1) : 1992 Construction of stone masonry - Code of practice: Part 1 rubble stone masonry

IS 1597 (Part 2) : 1992 Construction of stone masonry - Code of practice: Part 2 ashlar masonry

References

Recommended Books:

1. **"Building Construction" by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain**.
   Comprehensive coverage of building construction techniques, including masonry work.
2. **"A Textbook of Building Construction" by S.P. Arora and S.P. Bindra**.
   Detailed explanations and illustrations of various aspects of building construction, including masonry.
3. **"Masonry Structures: Behavior and Design" by Robert G. Drysdale, Ahmad M. Khalifa, and Lawrie R. Baker**.
   Focuses on the behavior and design principles of masonry structures, including seismic design aspects.
4. **"Masonry Design and Detailing for Architects and Contractors" by Christine Beall**.
   Practical guide covering masonry design principles, construction techniques, and detailing for architects and contractors.
5. **Bureau of Indian Standards (BIS) website-**
   Official website where you can access and purchase IS codes related to masonry and building construction: **https://www.bis.gov.in/**

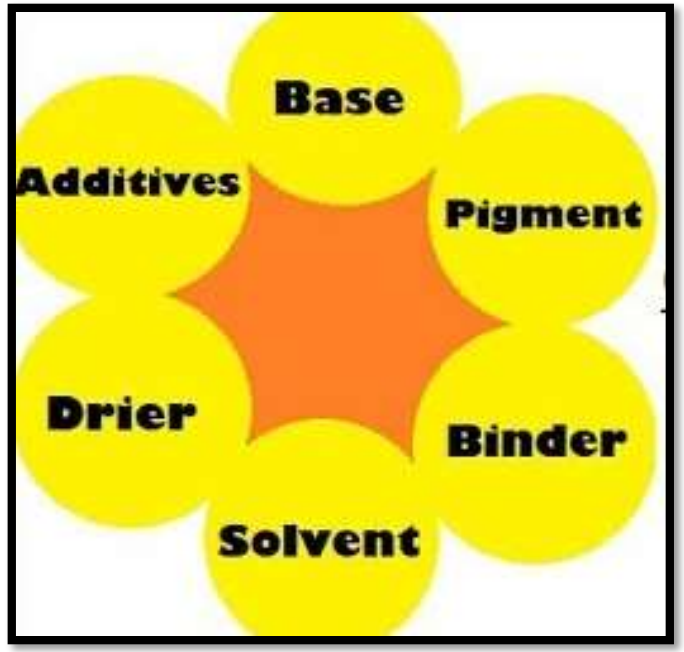
Paints

The best designed residential building will be considered unfinished if its properly plastered walls are not covered with a coat of proper **distemper in the interior and snowchem on the exterior.**

The paint and varnishes give the aesthetic appeal to the construction on the other hand and Also protect the material against deteriorating agents thereby increasing their life.

IS 15489 - "Painting Code of Practice":-This comprehensive code provides detailed guidelines for the painting of various types of surfaces, including preparation, application, and finishing

Ingredients of Paint



Essential Components

- Pigment – real colouring substance
- Solvent – in which pigment is dissolved
- Drier –Necessary to quicken process of evaporation

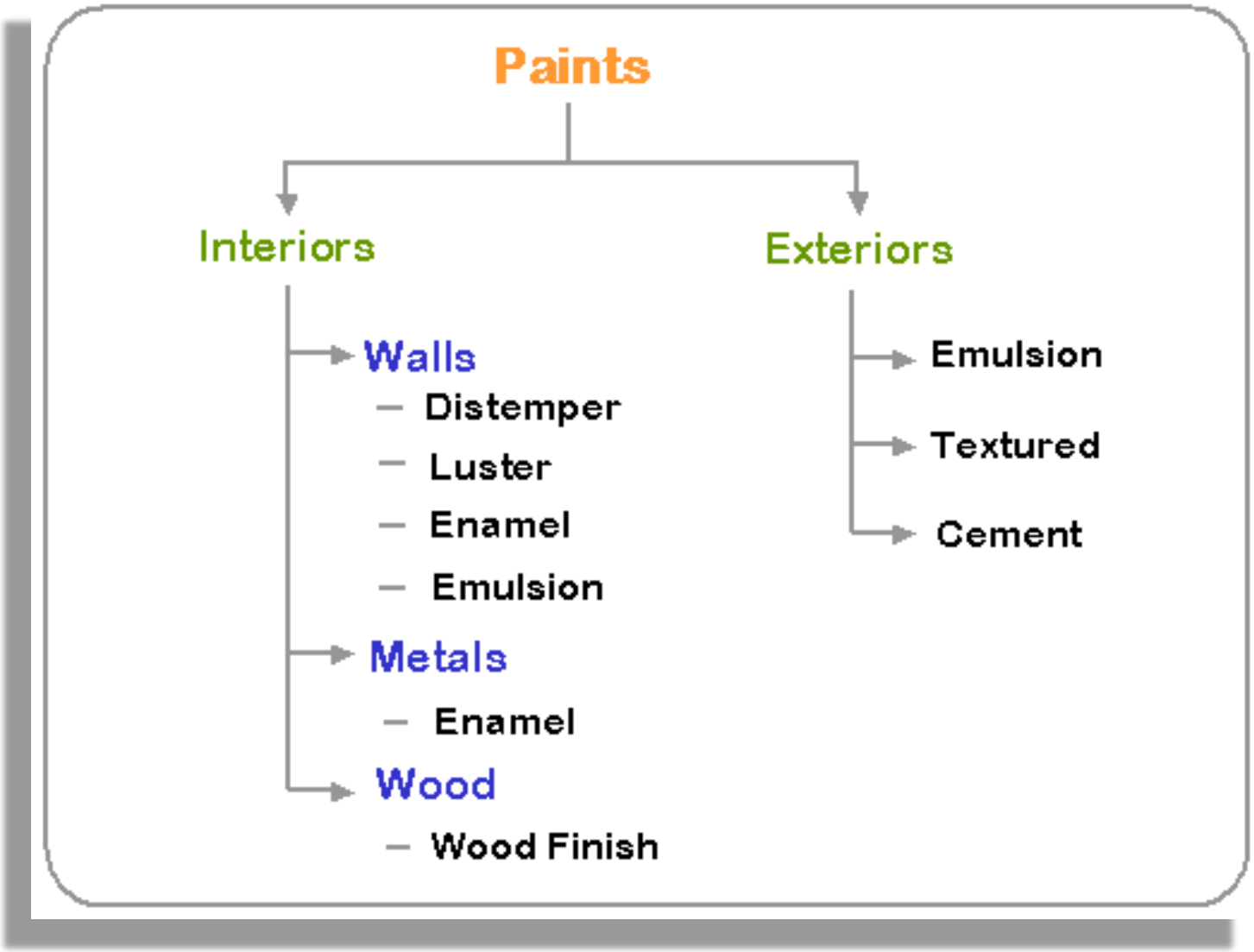
Major components for painting work in buildings

Component	Description	
Paint	Primary material used to coat surfaces, available in various types (emulsion, oil-based, acrylic).	
Primer	Preparatory coating applied before painting to enhance adhesion and durability of the topcoat.	
Paint Brushes and Rollers	Tools used for applying paint. Brushes for detail work and edges, rollers for large surface areas.	

Major components for painting work in buildings

Component	Description	Photo (example)
Paint Thinner or Solvent	Used to adjust paint viscosity, clean tools, or thin out paint for application.	
Surface Preparation	Includes sandpaper, patching compounds, fillers, and masking tape for preparing surfaces for painting.	
Safety Equipment	PPE such as gloves, goggles, and respirators to protect against paint fumes and chemicals.	
Ladders or Scaffolding	Equipment for reaching high or difficult-to-access areas safely during painting.	

Types of a Paint



- Oil Paint
- Enamel paint
- Lacquers
- Emulsion paint
- Synthetic paint
- Aluminium paint
- Cement paint
- Distemper

Relevant Indian Standards

Surface Type	IS Code	Type of Paint
Concrete	IS 5410:1992	Cement Paint
Masonry (Interior)	IS 15489:2004	Water-Based Acrylic Paint
Masonry (Exterior)	IS 15489:2004	Water-Based Acrylic Exterior Masonry Paint
Metal (Interior)	IS 2932:1983	Synthetic Enamel Paint (Brushing)
Metal (Exterior)	IS 2932:1983	Synthetic Enamel Paint (Spray)
Wood (Interior)	IS 2932:1983	Synthetic Enamel Paint (Brushing)
Wood (Exterior)	IS 2932:1983	Synthetic Enamel Paint (Spray)
Plaster (Interior)	IS 15489:2004	Water-Based Acrylic Paint
Plaster (Exterior)	IS 15489:2004	Water-Based Acrylic Exterior Masonry Paint

Relevant Indian Standards

Surface Type	IS Code	Type of Paint
Ferro Cement	IS 2932:1983	Synthetic Enamel Paint (Brushing)
Asbestos Cement	IS 5411:1992	Synthetic Resin Enamel Paint (Brushing)
Plywood	IS 2932:1983	Synthetic Enamel Paint (Brushing)
Galvanized Iron (GI)	IS 2932:1983	Synthetic Enamel Paint (Spray)
Aluminum	IS 2932:1983	Synthetic Enamel Paint (Spray)
Brick	IS 101:1989	Red Oxide Zinc Chrome Primer
Cement	IS 8662:2004	Water-Thinnable Cement Primer

IS codes related to the use of paint in buildings work

1. **IS 2395: Part 1 and 2 - "Painting of Concrete, Masonry, and Plaster Surfaces – Code of Practice":**

   Part 1: Operations and Workmanship: This part provides guidelines for the preparation of surfaces and the application of paint on concrete, masonry, and plaster surfaces. -
   Part 2: Schedule: This part includes a schedule of painting operations for different types of surfaces.

IS 2395: Part 1 and Part 2 are Indian Standards that provide guidelines for Surface Preparation , Paint Application, Drying and Curing, Maintenance, Performance and testing Requirements, Health and Safety for painting of concrete, masonry, and plaster surfaces.

2. IS 1477: Part 1 and 2 - "Code of Practice for Painting of Ferrous Metals in Buildings"

- **Part 1: Pretreatment:** This part covers the pretreatment of ferrous metal surfaces before painting.
- **Part 2: Painting:** This part provides guidelines for the application of paint on pretreated ferrous metal surfaces.

3. IS 2338: Part 1 and 2 - "Code of Practice for Finishing of Wood and Wood-Based Materials":

- **Part 1: Operations and Workmanship**: This part covers the preparation of wood and wood-based surfaces for painting.
- **Part 2: Schedule:** This part includes a schedule of painting operations for wood and wood-based materials.

4. IS 2394 - "Code of Practice for Application of Lime-Based Paints":

- **This standard provides guidelines for the preparation and application of lime-based paints on various surfaces.**

5. IS 5410 - "Cement Paints – Specification":

- **This standard specifies the requirements for cement-based paints used on concrete and masonry surfaces, including their composition, properties, and performance.**

6. IS 158 - "Ready Mixed Paint, Brushing, Bituminous, Black, Lead-Free, Acid, Alkali, and Heat-Resisting – Specification"

- **This standard specifies the requirements for ready-mixed bituminous paints used as waterproofing membrane.**

7. IS 428 - "Distemper, Dry, Colour as Required – Specification"

- **Distemper paint is commonly used in homes and commercial buildings. This standard specifies the requirements for dry distemper used for painting walls and ceilings.**

8. IS 427 - "Distemper, Oil Emulsion – Specification"

- **This standard specifies the requirements for oil emulsion distemper used for interior painting**

10. IS 2932 -Enamel, Synthetic, Exterior

- **Suitable for painting exterior walls, doors, window frames, metal structures, fences, etc.**

11. IS 2933 -Enamel, Synthetic, Interior

- **Suitable for painting interior walls, doors, window frames, metal structures, fences, etc.**

12. IS 15489 -Painting Code of Practice

- **This comprehensive code provides detailed guidelines for the painting of various types of surfaces, including preparation, application, and finishing.**

References

Books

1. **"Painting and Decorating Level 1 Diploma" by Ann Cook**
   Comprehensive coverage of painting and decorating techniques, tools, materials, and safety procedures.

2. **"Modern Painting Technology" by B. P. Bhardwaj**
   Covers various painting techniques, materials, and advancements in painting technology.

3. **"Architectural Painting Specification Manual" by Painting and Decorating Contractors of America (PDCA)**
   Detailed specifications for various painting tasks, including preparation, application, and finishing.

4. **"Surface Coatings: Science and Technology" by Swaraj Paul**
   Discusses the chemistry, application, and testing of different types of coatings used in the building industry.

International Standards

ISO Standards

ISO 12944: Paints and varnishes — Corrosion protection of steel structures by protective paint systems.

ISO 11998: Paints and varnishes – Determination of wet-scrub resistance and clean ability of coatings.

ASTM Standards

ASTM D3276: Standard Guide for Painting Inspectors (Metal Substrates).

ASTM D3359: Standard Test Methods for Measuring Adhesion by Tape Test.

ASTM D7234: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

British Standards (BS)

BS 6150: Painting of buildings. Code of practice.

BS EN ISO 2409: Paints and varnishes – Cross-cut test.

Timber Structures in Buildings

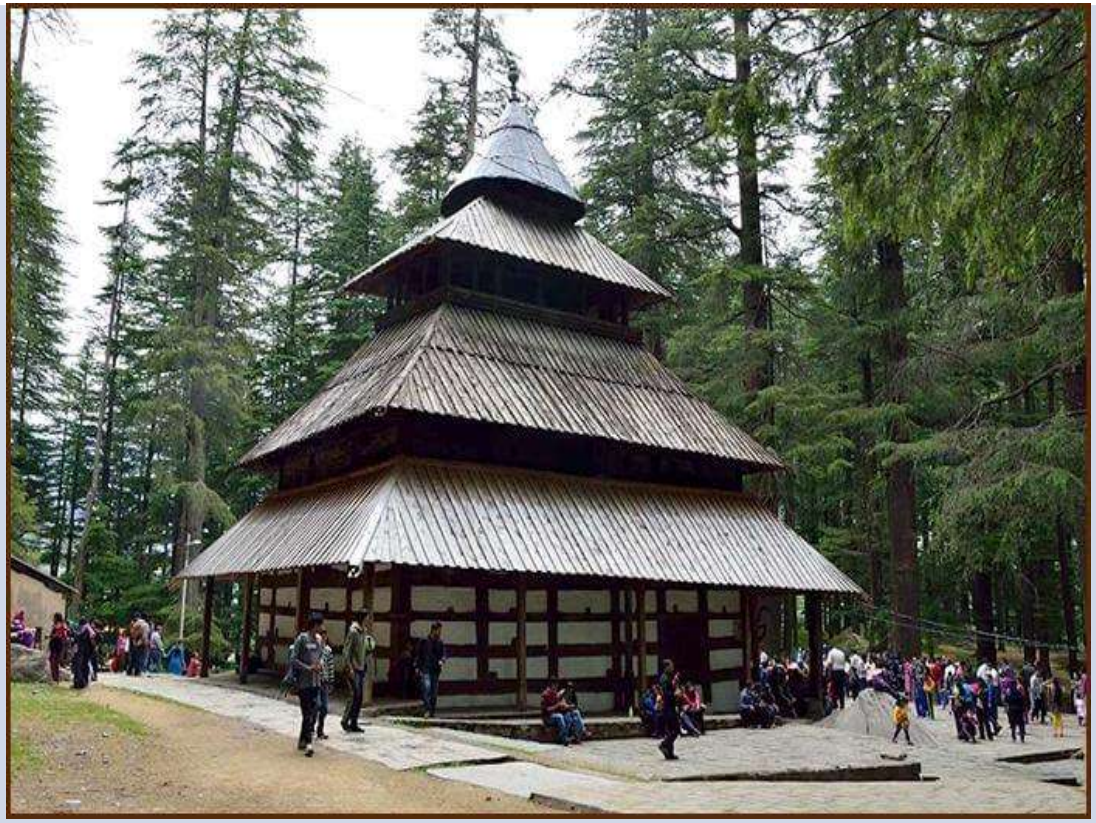
Timber structures in building construction involves utilizing wood as a primary material for various structural components. Timber has been used for centuries in construction due to its availability, sustainability, strength-to-weight ratio, and aesthetic appeal.

"Wood is universally beautiful to man. It is the most humanly intimate of all materials." - Frank Lloyd Wright

Examples of buildings where timber has been prominently featured

Hall of Nations
Pragati Maidan, New Delhi, India

Hidimba temple, Manali



➢Timber is a versatile building material used in various structural applications due to its strength, flexibility, and aesthetic appeal.

▪**Here are some of the main types of timber structures and their applications:**

1. Timber Frame Structures(IS 883:2016)

- **Post-and-Beam Construction:** Involves vertical posts and horizontal beams forming a skeleton.
- Used in residential buildings, barns, and some commercial structures as per **IS 883:2016 - Code of Practice for Design of Structural Timber in Building**

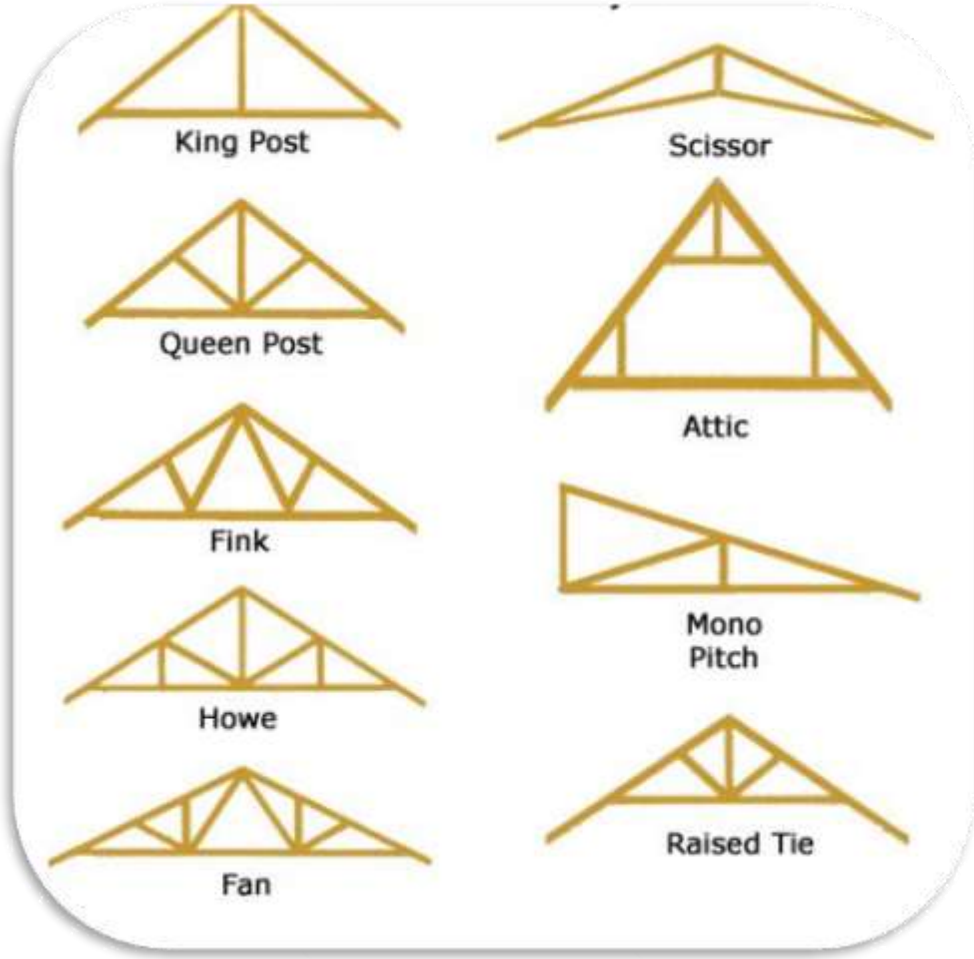
2. Timber Roof Trusses (IS 883:2016)

➢ **King Post Truss:** Simplest type with a central vertical post and two angled beams. Common in smaller spans.

➢ **Queen Post Truss:** Similar to king post but with two vertical posts, allowing for longer spans.

➢ **Fink Truss:** Triangular units with internal web members, widely used in residential and commercial buildings.

➢ **Scissors Truss:** Has two angled bottom chords that create a vaulted ceiling.

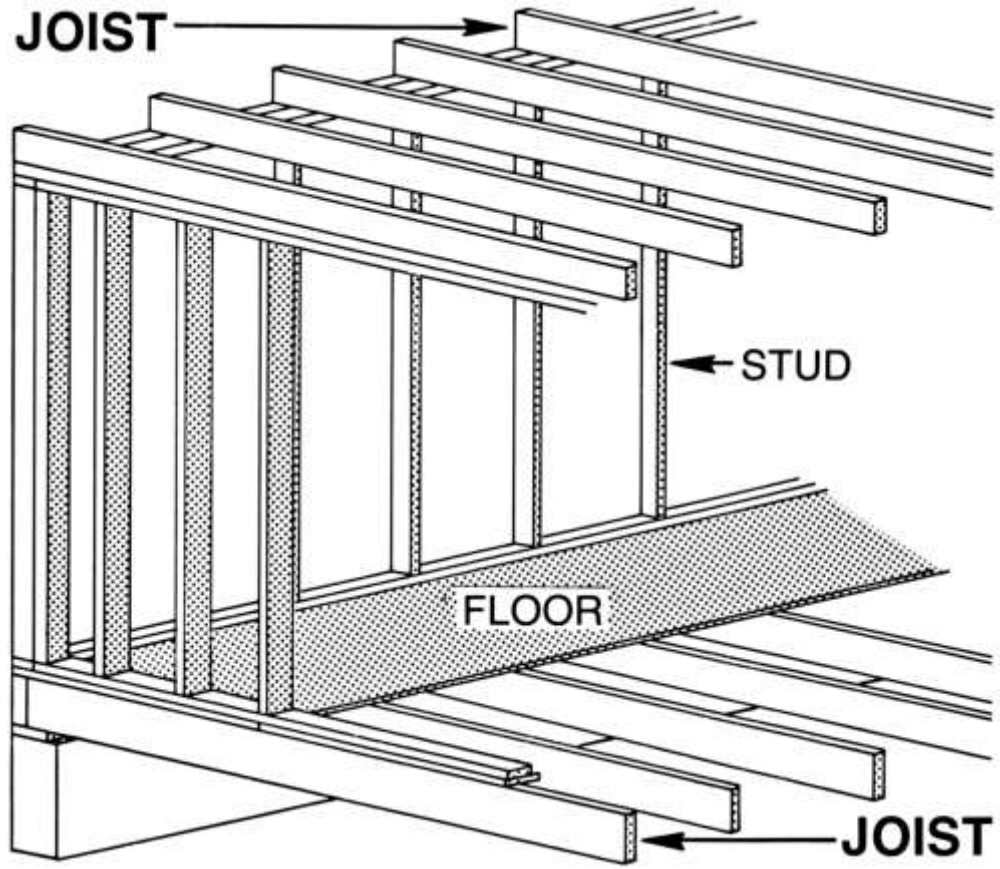


3. Timber Beams and Joists(IS 883:2016)

➢**Solid Timber Beams:** Used in traditional construction for supporting floors and roofs.

➢ **Glulam (Glued Laminated Timber) Beams:** Made by gluing together layers of timber, allowing for longer spans and more complex shapes.

➢**I-Joists:** Engineered wood products that resemble the letter "I", used for floor and roof joists due to their strength and lightweight.



4. Timber Decking -

➢**Outdoor Decking:** Used for patios, balconies, and garden walkways. Designed to withstand weather and load conditions

5. Timber Cladding

➢**Weatherboards:** Horizontal or vertical boards used to clad the exterior of buildings.

7. Timber Flooring

➢**Solid Wood Flooring:** Made from single pieces of timber, offering durability and a traditional look.

➢**Engineered Wood Flooring:** Layers of wood glued together, providing stability and resistance to moisture changes.

✓**IS 3670 : 1989-Code of practice for construction of timber floors**

8. Timber Bridges

- **Beam Bridges:** Simple, supported by beams and used for short spans.
- **Truss Bridges:** Use a truss system of interconnected elements to support loads over longer spans.
- **Arch Bridges:** Utilize the natural strength of an arch to support loads.

9. Timber Piles- (IS 2911 (Part 2) : 2021)
Used in foundation systems where timber posts are driven into the ground to support structures, especially in areas with poor soil conditions.

10. Timber Retaining Walls -Structures used to hold back soil or water, commonly used in landscaping and civil engineering projects.

11. Timber Scaffolding
(IS 3696 (Part 1/2):1987)

➢Temporary structures used during construction for access to high areas. Still used in regions where wood is abundant.

Relevant Indian Standards

Timber Structure Type	Description	Relevant Indian Standard Codes
Timber Frame Structures	Structural framework with vertical posts and horizontal beams.	IS 883:2016 - Code of Practice for Design of Structural Timber in Building
Timber Roof Trusses	Frameworks for supporting roofs.	IS 883:2016
Timber Beams and Joists	Horizontal members supporting floors and roofs.	IS 883:2016
Timber Columns and Posts	Vertical members transferring loads to the foundation.	IS 883:2016, IS 4021:1995
Timber Decking	Horizontal planks for outdoor spaces.	IS 883:2016
Timber Cladding	External coverings for walls.	IS 883:2016, IS 13622:1993
Timber Flooring	Structural and decorative floor systems.	IS 883:2016, IS 3637:1989
Timber Bridges	Bridges made using timber, for light and pedestrian traffic.	IS 883:2016

Relevant Indian Standards

Timber Structure Type	Description	Relevant Indian Standard Codes
Timber Piles	Foundation systems using driven timber posts.	IS 883:2016, IS 2911 (Part 1/Sec 3):2010 - Code of Practice for Design and Construction of Pile Foundations, (IS 2911 (Part 2) : 2021)
Timber Retaining Walls	Walls used to hold back soil or water.	IS 4998 (Part 1):1992 - Criteria for Design of Reinforced Concrete and Masonry Structures for Hydraulic Retaining Structures, applies to timber with relevant adjustments
Timber Scaffolding	Temporary structures for construction access.	IS 3696 (Part 1):1987 - Safety Code of Scaffolds and Ladders
Timber Shear Walls	Walls designed to resist lateral forces.	IS 883:2016
Timber Domes and Shells	Advanced structures for large, open spaces.	IS 883:2016
Cross-Laminated Timber (CLT) Panels	Engineered wood product used for floors, walls, and roofs.	IS 883:2016, Emerging standards and guidelines as CLT is a newer technology

References

Books

1. **"Timber Construction Manual" by American Institute of Timber Construction (AITC)**
   Covers design, construction, and maintenance of timber structures, including laminated timber and connections.
2. **"Wood Engineering and Construction Handbook" by Keith F. Faherty and Thomas G. Williamson**
   Detailed information on wood properties, design principles, and construction techniques for timber structures.
3. **"Structural Wood Design: A Practice-Oriented Approach" by Abi Aghayere and Jason Vigil**
   Focuses on practical design techniques for structural wood, load calculations, and design of timber elements.
4. **"Design of Wood Structures – ASD/LRFD" by Donald E. Breyer, Kelly Cobeen, Kenneth Fridley, and David Pollock**
   Covers Allowable Stress Design (ASD) and Load and Resistance Factor Design (LRFD) methods for wood structures.
5. **"Wood: Craft, Culture, History" by Harvey Green**
   Provides a historical and cultural perspective on the use of wood in construction.

Glass

The term Glass signifies an amorphous solid substance that has been formed by super cooling; a liquid solution containing chiefly silica and some other selected components.

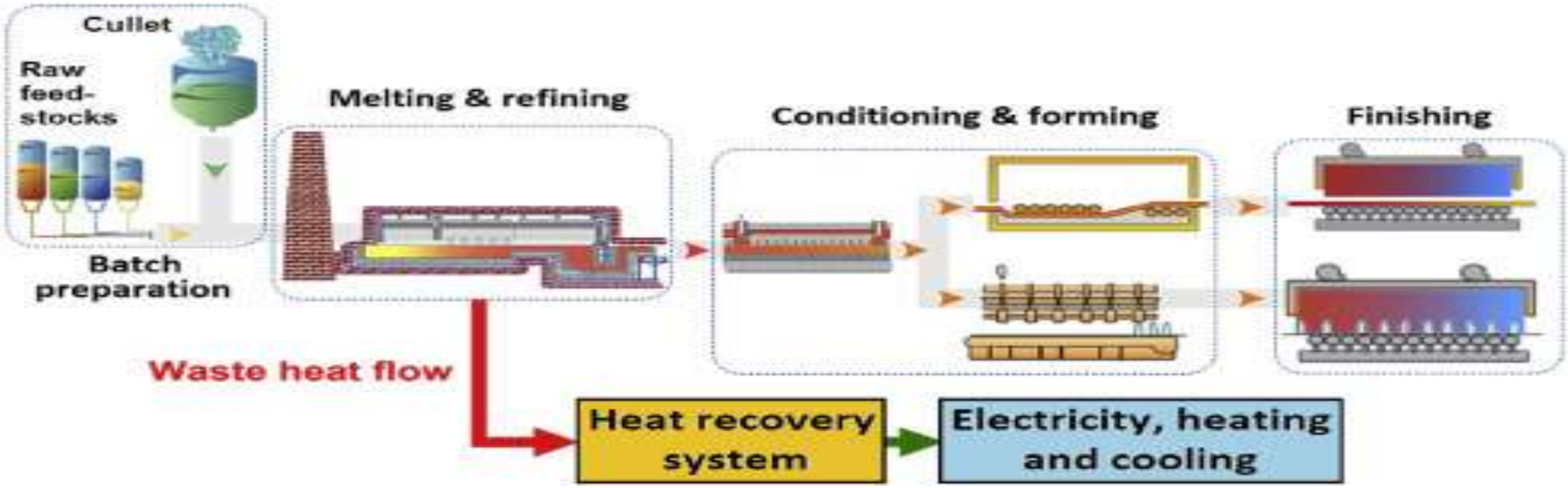
Cybertecture egg: Under construction


W

Manufacturing

The basic raw material for the manufacturing of good quality glass is **silica**, which in nature occurs as quartz (SiO_2), the material melts at 1700 ^{0}C and is cooled rapidly without allowing It to undergo recrystallization.Quartz and other desired components are heated in special melting furnace. The molten glass comes out, rather flows, from these furnaces continuously. Various Glass shapes are obtained from this molten glass by one of the following process such as pressing, blowing drawing.

Manufacturing



Properties of Glass

- Quite high tensile strength.
- The ordinary glass thread possess tensile strength of 700 to 1400 kg/ cm^2
- The modulus of elasticity of glass is also very high.
- Glasses have low ductility, low conductivity and low coefficient of thermal expansion.
- Glasses are resistant to acids and many other chemicals hence they are ideal material for storage of chemicals.
- Glasses are very good electrical Insulators
- They have very high softening point and can be used at high temperature.

Types of glass and their common applications

Type of Glass	Description	Common Applications
Float Glass	Clear, flat glass with uniform thickness, produced by floating molten glass on a bed of molten metal.	Windows, doors, facades
Toughened Glass	Heat-treated to increase strength and safety. Shatters into small, blunt pieces when broken.	Glass doors, partitions, balustrades
Laminated Glass	Sandwiched layers of glass bonded with a tough plastic interlayer (PVB or EVA). Holds together when shattered, providing safety.	Safety glazing, overhead glazing, hurricane-resistant windows
Reflective Glass	Coated with a metallic layer to reflect heat and light. Reduces solar heat gain and glare.	Skyscraper facades, energy-efficient buildings
Low-E (Low Emissivity) Glass	Coated with a thin layer of metal oxide to reduce heat transfer while allowing light transmission.	Energy-efficient buildings, climate control
Solar Control Glass	Treated to reduce solar heat gain and UV radiation. Enhances energy efficiency by controlling heat transmission.	Facades, windows, skylights

Types of glass and their common applications

Type of Glass	Description	Common Applications
Patterned Glass	Textured or embossed with patterns on one or both surfaces. Provides privacy while allowing light transmission.	Interior partitions, decorative panels
Wire Glass	Embedded with a wire mesh for added strength and safety. Provides fire resistance and impact resistance.	Fire-rated doors, windows, partitions
Fire-Rated Glass	Designed to withstand fire for a specified period, maintaining integrity and insulation.	Fire-rated doors, partitions, assemblies
Acoustic Glass	Laminated glass designed to reduce noise transmission. Improves sound insulation properties.	Buildings near airports, highways, urban areas
Decorative Glass	Customized with etching, frosting, or colored films for aesthetic purposes. Enhances interior design and visual appeal.	Interior design elements, feature walls
Smart Glass	Can change light transmission properties based on external conditions or user control. Includes electrochromic, thermochromic, and photochromic technologies.	Modern buildings, adaptive shading, privacy control

Relevant Indian Standards

IS 14900:2000 - Glass for Buildings:

- This standard covers requirements for various types of glass used in buildings, including float glass, tinted glass, reflective glass, laminated glass, etc.
- It specifies dimensions, tolerances, safety requirements, and quality control measures for different types of architectural glass.

IS 2553 (Part 1):1990 - Safety Glass, Part 1: Non-wired Glass:

- Part 1 of IS 2553 deals with non-wired safety glass, including toughened (tempered) glass and heat-strengthened glass.
- It provides specifications for the manufacture, testing, and installation of safety glass to ensure resistance to impact and safety in case of breakage.

Relevant Indian Standards

IS 2553 (Part 2):1992 - Safety Glass, Part 2: Wired Glass

- Part 2 of IS 2553 covers wired safety glass, which includes wired glass panels used for fire-resistant glazing and safety applications.
- It specifies the requirements for wire mesh embedded in the glass and its impact resistance properties.

IS 16231:2016 (Part 1 to 4) – Use of Glass in Building

- This standard provides guidelines for the design, installation, and use of glass in buildings.It covers aspects such as structural design considerations, safety criteria, thermal performance, and maintenance requirements for glass installations.

Relevant Guidelines

National Building Codes (NBC):

- The National Building Code of India (NBC) includes provisions related to the use of glass in building construction.
- Covers aspects such as safety, fire resistance, and energy efficiency requirements for glass installations.

Green Building Standards (e.g., IGBC, GRIHA):

- Provide guidelines for sustainable building practices, including the use of energy-efficient materials such as low-e glass and solar control glass.

Energy Conservation Building Code (ECBC):

- Includes provisions for energy-efficient building design, which may affect the use of glass for thermal insulation and solar control.

Mapping of type of Glass with ISS

Type of Glass	Description	Relevant Indian Standard (IS)
Float Glass	Clear and flat glass with uniform thickness, produced by floating molten glass on a bed of molten metal.	IS 14900:2000
Toughened Glass	Glass that has been heat-treated to increase its strength and safety. When broken, it shatters into small, blunt pieces.	IS 2553 (Part 1):1990
Laminated Glass	Glass made by sandwiching a plastic interlayer between two or more glass layers. It holds together when shattered, providing safety.	IS 2553 (Part 2):1992
Wired Glass	Glass that contains a wire mesh embedded within it, providing additional strength and safety.	IS 5437:1994
Insulating Glass Units	Multiple glass panes separated by a spacer and sealed to form a unit, providing thermal and acoustic insulation.	IS 14618:1999

Mapping of type of Glass with ISS

Type of Glass	Description	Relevant Indian Standard (IS)
Heat-Strengthened Glass	Glass that has been partially tempered to provide increased strength over annealed glass but less than fully tempered glass.	IS 2553 (Part 1):1990
Reflective Glass	Glass with a metallic coating that reflects heat and light, reducing glare and solar heat gain.	IS 16231:2016
Patterned Glass	Glass that has been embossed with a pattern on one or both surfaces, often used for decorative purposes.	IS 2835:1987
Fire-Resistant Glass	Glass that can withstand high temperatures and resist fire, providing safety in case of fire incidents.	IS 16231:2016

References

Books

1. **"Glass in Building: A Guide to Modern Architectural Glass Performance" by Patricia J. Lyons** - This book covers the properties, performance, and applications of different types of architectural glass.

2. **Architectural Glass to Resist Seismic and Extreme Climatic Events" by Richard A. Behr** - Focuses on the design and performance of glass in buildings, especially under seismic and extreme weather conditions.

3. **Glass Engineering: Design Solutions for Automotive, Building, and Other Applications" by Jerry J. Slack** - Discusses the engineering aspects of glass design for various applications, including building construction.

4. **Glass Construction Manual" by Christian Schittich** - Provides detailed information on the construction techniques, design principles, and material properties of glass in architecture.

5. **Facade Construction Manual" by Thomas Herzog, Roland Krippner, and Werner Lang** - Although focused on facades, this book covers the use of glass in building envelopes extensively.

6. **National Glass Association (NGA) Guidelines*** - Provides a range of technical resources and best practice guidelines for the glazing industry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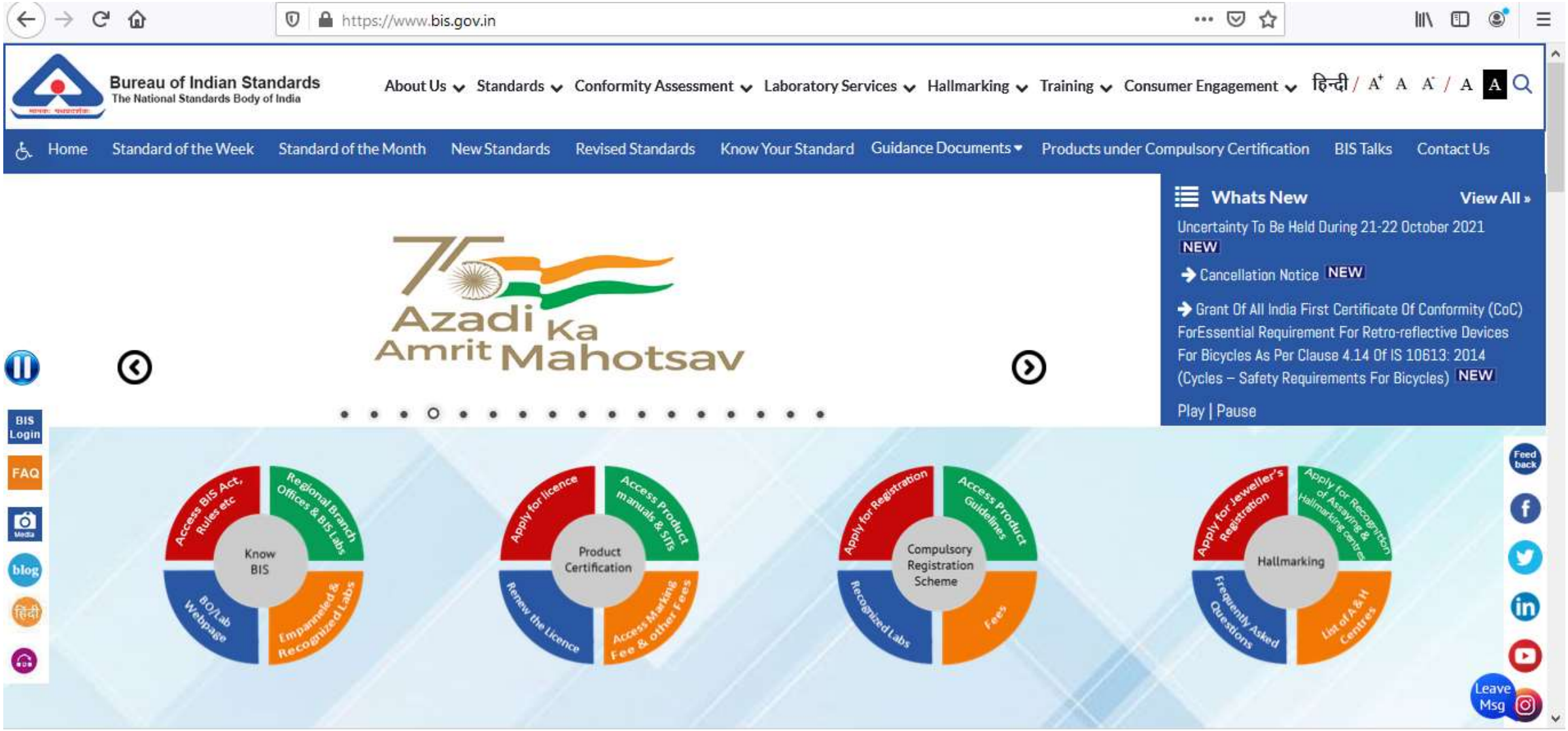

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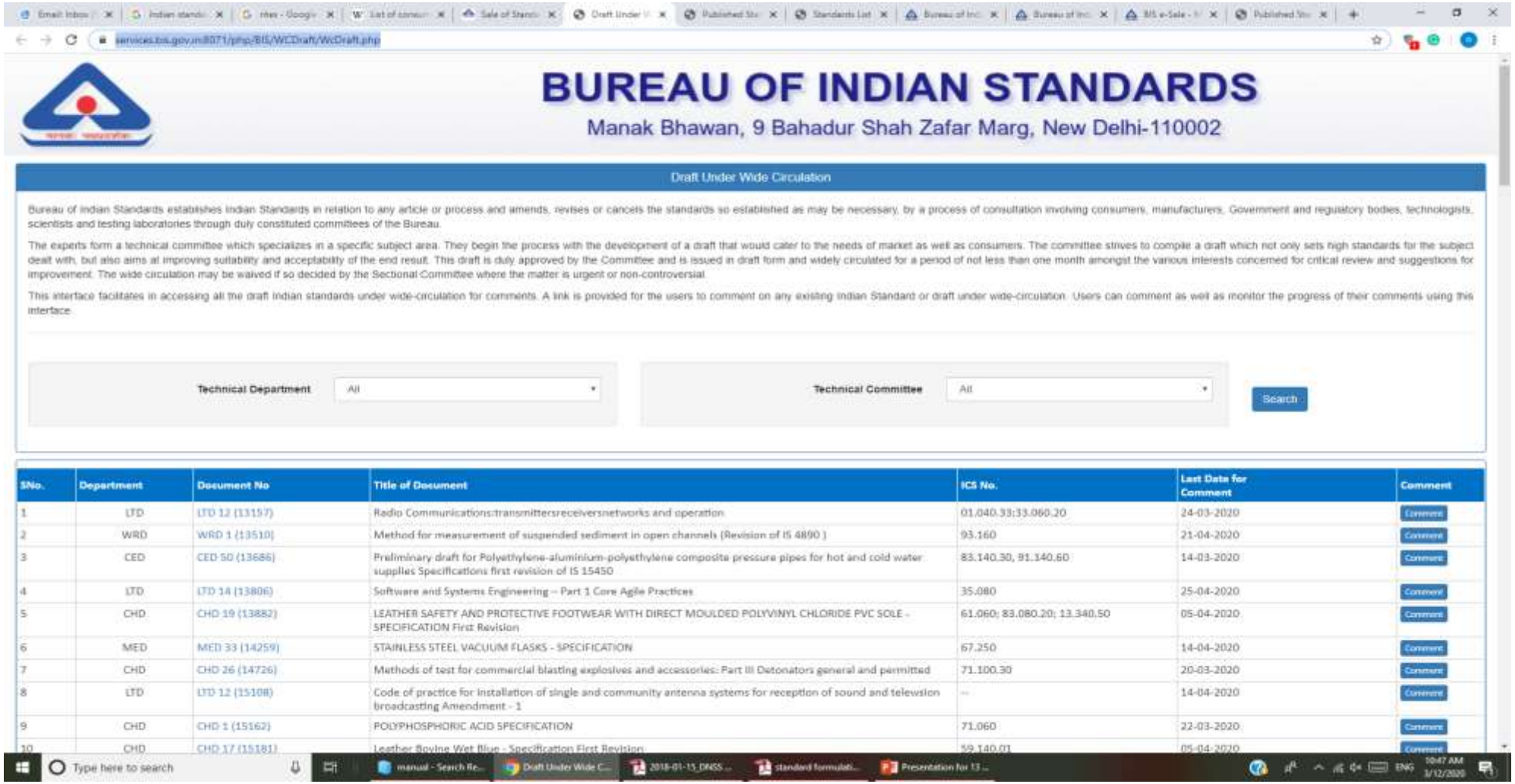

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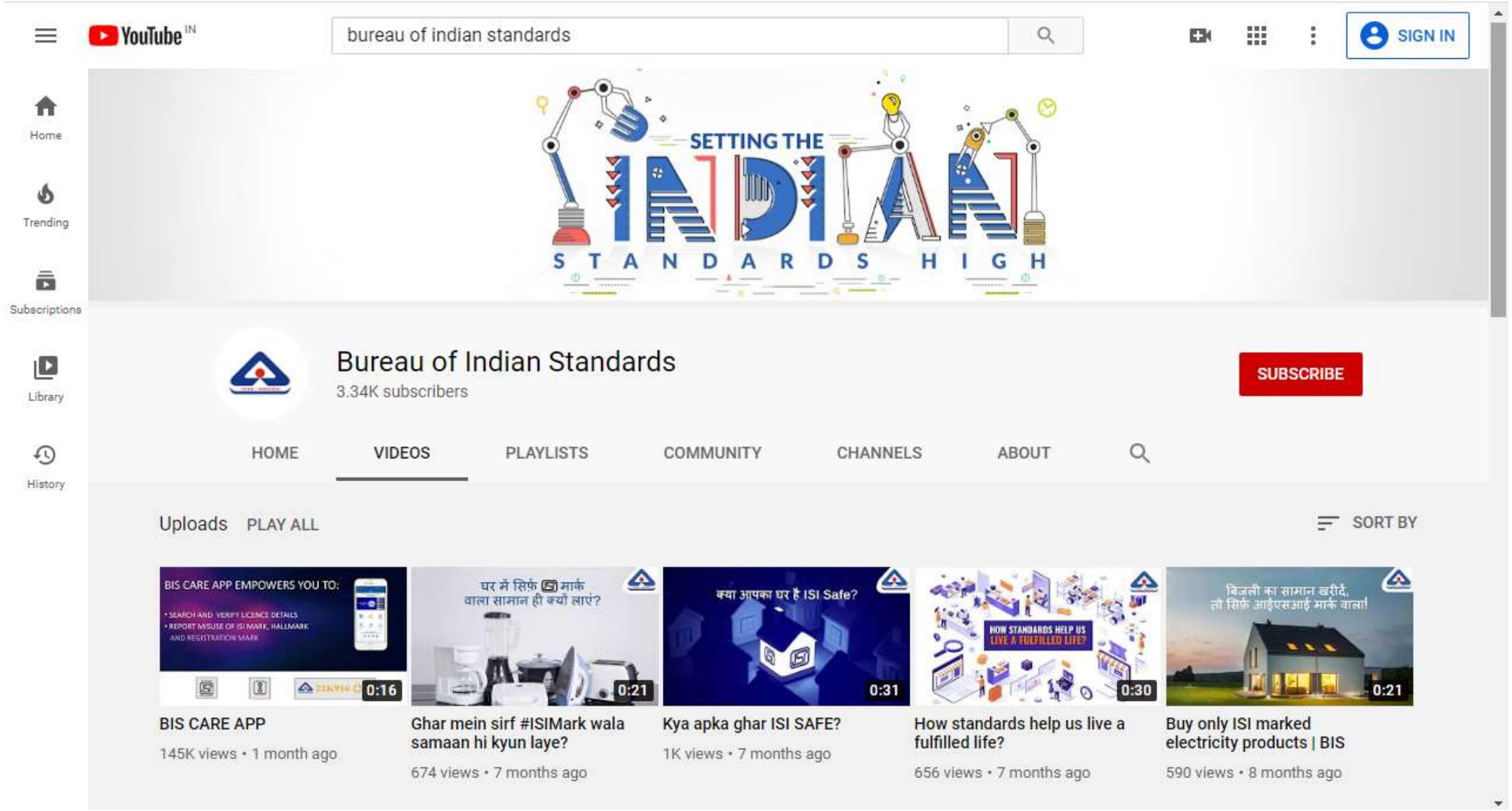

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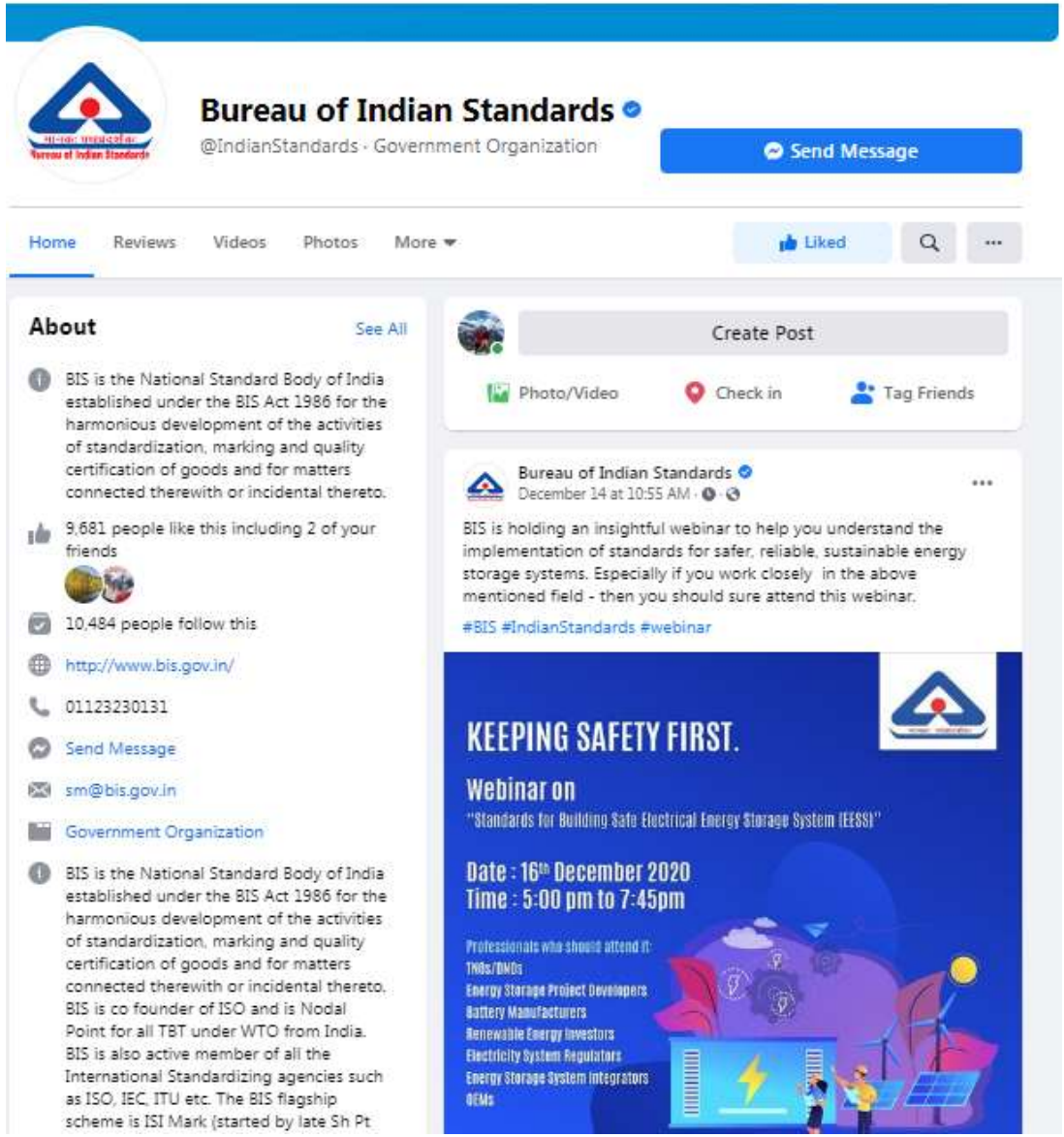

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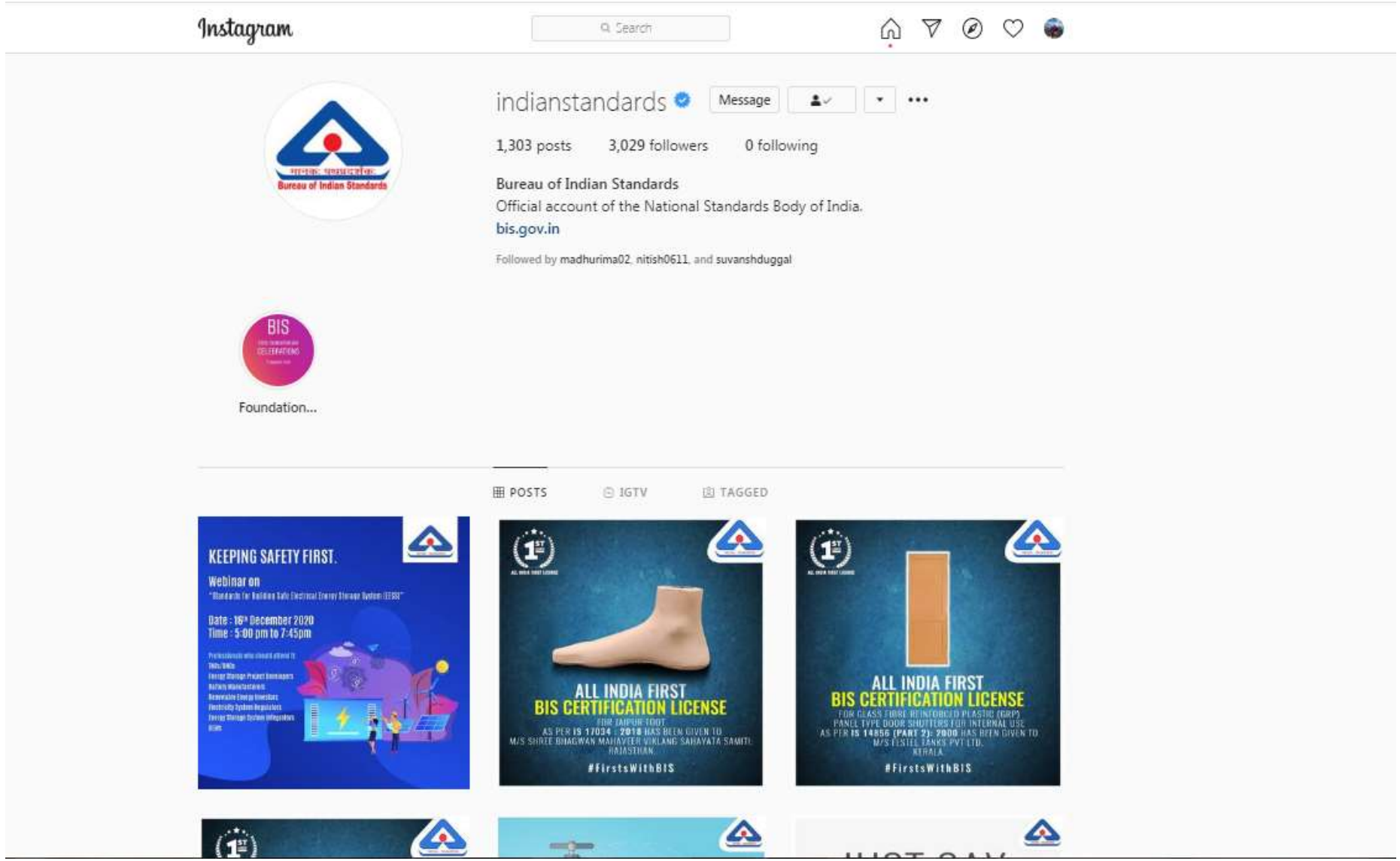

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