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Construction Materials - 25CE11I

I Year branch Subject

Manual

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Experiment 1

Identification, Properties, and Applications of different Rocks

1. Granite
2. Basalt
3. Sandstone
4. Limestone

1. Granite (ಕಟ್ಟಡದ ಕಲ್ಲು)

Identification:

- Appearance: **Light to dark gray**, coarse-grained texture with visible crystals of **quartz, feldspar, and mica**.
- Hard and **non-porous**.

Properties:

- **High compressive strength**: 130–200 MPa
- **Very hard and durable**
- **Low water absorption** (<1%)
- Resistant to **weathering and abrasion**

Applications:

- **Building foundations**
- **Polished flooring and countertops**
- **Monuments, bridges, and exterior cladding**

- **2. Basalt (ಕಂದುಬಣ್ಣದ ಅಗ್ನಿಶಿಲೆ)**

Identification:

- Appearance: **Dark gray to black**, **fine-grained**, dense and heavy.
- May contain small **air holes (vesicles)**.

Properties:

- **Very high compressive strength**: 100–300 MPa
- **Tough and durable**
- Non-reactive with most chemicals
- Low porosity

Applications:

- **Road base**, **railway ballast**
- **Aggregates in concrete**
- Used in **retaining walls** and **masonry work**

- **3. Sandstone (ಮರಳುಗಲ್ಲು)**

Identification:

- Appearance: **Light brown, red, or yellow**, **layered**, medium-grained texture.
- Grains **can be rubbed off** with a knife.

Properties:

- **Moderate strength**: 40–100 MPa
- **Porous**, absorbs water easily
- Easy to **cut and shape**

Applications:

- **Wall cladding**, **paving**, and **flooring**
- Used in **heritage buildings** and **carvings**
- Preferred in **dry regions** due to thermal comfort

4. Limestone (ಸುಣ್ಣದ ಕಲ್ಲು)

Identification:

- Appearance: **White to light gray**, **fine-grained**, smooth texture
- Reacts with **dilute HCl acid (fizzing)** due to **calcium carbonate**

Properties:

- **Low to moderate strength**: 30–90 MPa
- **High water absorption**
- **Soft** and easily shaped

Applications:

- **Cement and lime manufacturing**
- **Building blocks and panels**
- Suitable for **interior walls and flooring**

Experiment 2
Identification, Properties & Applications of Rocks

1. Laterite
2. Marble
3. Quartzite
4. Gneiss
5. Slate
6. River sand
7. M- Sand
8. P-sand
9. F-sand

1. Laterite

Identification:

- **Reddish-brown color**, porous texture
- Easily scratched with a knife
- Often shows **honeycomb structure**

Properties:

- **Soft when freshly quarried**, hardens on exposure
- **High porosity** → absorbs water
- Rich in **iron** and **aluminium oxides**
- Low to moderate compressive strength (20–60 MPa)

Applications:

- Used in **rural construction** for walls and foundations
- Good for **load-bearing masonry** in tropical areas
- Employed in **road sub-base layers**

2. Marble

Identification:

- **Smooth, polished texture**, often with **veins**
- Available in **white, green, pink, or black** colors
- Crystalline appearance

Properties:

- **Moderate strength** (~70–100 MPa)
- **Easily polishable** and decorative
- Reacts with **dilute HCl** (contains calcium carbonate)
- Susceptible to **acids and scratches**

Applications:

- Used for **flooring**, **wall cladding**, **sculptures**, and **tabletops**
- Common in **temples, hotels, and luxury buildings**
- Preferred for **aesthetic interiors**

3. Quartzite

Identification:

- **Hard**, **dense**, and **glassy** texture
- May appear **white, gray, or pink**
- Resembles sandstone but much harder

Properties:

- **Very high compressive strength** (150–300 MPa)
- **Extremely durable** and weather-resistant
- **Non-porous** and **acid-resistant**

Applications:

- Used in **high-wear flooring** and **driveways**
- Exterior **paving**, **facades**, and **garden paths**
- Excellent for **countertops**

4. Gneiss

Identification:

- **Banded or layered appearance** due to mineral alignment
- Can resemble granite but with a **striped pattern**
- Texture is coarse and crystalline

Properties:

- High strength (comparable to granite, 100–250 MPa)
- Durable and **resistant to weathering**
- Tough, with **directional cleavage planes**

Applications:

- Used in **building blocks**, **paving**, and **filler material**
- Popular in **landscaping and retaining walls**
- Suitable for **general masonry** in low-cost structures

5. Slate

Identification:

- **Dark gray to black**, fine-grained
- **Splits into thin sheets** (excellent cleavage)
- Smooth surfaces, dense feel

Properties:

- Low to moderate strength (60–100 MPa)
- **Water-resistant** and **thermally insulating**
- Good **sound insulation**

Applications:

- **Roofing tiles**, **flooring slabs**, **wall cladding**
- Used in **laboratory tabletops**, **blackboards**, and **kitchen counters**
- Decorative interior uses

Suggested Lab Observation Table:

Rock Type	Color & Texture	Grain Size	Hardness	Water Absorption	Use in Construction
Laterite	Reddish, porous	Coarse	Low	High	Rural walls, sub-base
Marble	Veined, smooth	Fine	Medium	Medium	Decorative floors, statues
Quartzite	Hard, glassy	Fine	High	Low	Outdoor flooring, countertops
Gneiss	Banded, coarse	Coarse	High	Low	Building blocks, landscaping
Slate	Layered, dark	Fine	Medium	Low	Roofing, flooring

Experiment 3
Field Tests on Cement

1. Colour
2. Date of Manufacturing
3. Temperature
4. Smoothness
5. Lumps
6. Water Sinking

1. Colour Test
Purpose:
To check the **uniformity** and quality of cement.
Procedure:

- Observe a small quantity of cement under natural light.
- Note the **shade and consistency** of the color.

Expected Result:

- Cement should be **uniform grey** with a light greenish tinge.

Interpretation:

- **Dull or inconsistent color** may indicate impurities or poor quality.

2. Date of Manufacturing
Purpose:
To ensure cement is **not expired**, as it loses strength over time.
Procedure:

- Check the **date printed on the cement bag**.
- Cement should be used within **3 months** from the date of manufacture.

Expected Result:

- Date should be **within 90 days** of use.

Interpretation:

- **Old cement** may have reduced strength due to moisture absorption.

3. Temperature Test

Purpose:

To detect **hydration** due to moisture absorption in storage.

Procedure:

- Insert your hand into a fresh bag of cement.

Expected Result:

- Cement should feel **cool and dry** to the touch.

Interpretation:

- If it feels **warm**, it may have started **hydrating**, reducing its effectiveness.

4. Smoothness Test

Purpose:

To assess the **fineness** of cement particles.

Procedure:

- Rub a pinch of cement between your fingers.

Expected Result:

- Cement should feel **smooth** and fine.

Interpretation:

- If it feels **gritty**, it indicates **coarse particles** and low fineness.

5. Lumps Test

Purpose:

To check for **moisture contamination** during storage.

Procedure:

- Press the cement bag or take a sample and **break apart with fingers**.

Expected Result:

- There should be **no visible hard lumps**.

Interpretation:

- Lumps indicate **hydration** or **poor storage**, making it unsuitable for use.

6. Water Sinking Test

Purpose:

To check the **reaction of cement with water** (basic setting behavior).

Procedure:

- Sprinkle cement gently over the surface of water in a container.

Expected Result:

- **Cement should float** for a few moments and then sink **gradually**.

Interpretation:

- Immediate sinking may indicate **poor quality** or contamination.

Summary Table:

Test	Good Result	Bad Indication
Colour	Uniform grey with greenish tint	Pale or mixed colors
Date of Mfg.	Within 3 months	Older than 90 days
Temperature	Cool to touch	Warm = moisture contamination
Smoothness	Smooth and fine	Gritty = coarse particles
Lumps	Free-flowing powder	Hard lumps = moisture present
Water Sinking	Floats then sinks slowly	Immediate sinking = bad quality

Experiment 4
Field tests on bricks

1. Shape, Size and Colour
2. Soundness
3. Density
4. Cracks
5. Hardness
6. Water absorption test.

1. Shape, Size and Colour

Purpose:

To check whether the bricks are of uniform shape, correct size, and good colour, indicating proper burning and quality.

Procedure:

- Visually inspect the bricks for rectangular shape with sharp edges and even surfaces.
- Compare the brick dimensions with standard size (190 × 90 × 90 mm).
- Observe the colour — it should be uniform deep red.

Expected Result:

- Bricks should be uniform in size and shape, with sharp edges.
- Colour should be deep red, indicating proper burning.

2. Soundness Test

Purpose:

To determine the hardness and uniformity of bricks and check for internal cracks.

Procedure:

- Strike two bricks gently together.
- Listen to the sound produced.
- Observe if the bricks break or chip.

Expected Result:

- Good bricks produce a clear ringing sound.
- Bricks should not break or develop cracks during the test.

3. Density Test (Heft Test)

Purpose:

To check the weight and density of the brick, which indicates strength and quality.

Procedure:

- Hold a brick in hand and compare its weight with another of the same size.
- A heavier brick is generally denser and stronger.
- Optionally, measure density = mass/volume if instruments are available.

Expected Result:

- Bricks should feel heavier and compact.
- Lightweight bricks indicate porosity and poor strength.

4. Cracks Observation

Purpose:

To check the brick for visible defects, cracks, and flaws that weaken masonry.

Procedure:

- Visually inspect all faces and edges of the brick.
- Note any visible cracks, warping, or uneven edges.

Expected Result:

- A good-quality brick should be free from visible cracks or lumps.
- Should have a uniform, smooth surface without deformation.

5. Hardness Test

Purpose:

To assess the surface hardness and strength of the brick.

Procedure:

- Scratch the surface of the brick with a steel knife or fingernail.
- Observe the mark left on the surface.

Expected Result:

- The surface should not show visible scratches.
- Indicates that the brick is hard and well-burnt.

6. Water Absorption Test

Purpose:

To measure the porosity of the brick, which affects durability and strength.

Procedure:

1. Weigh the dry brick (W_1).
2. Immerse it in clean water for 24 hours.
3. Wipe the surface and weigh again (W_2).
4. Calculate: Water Absorption (%) = $((W_2 - W)/W_1)X\ 100$

Expected Result:

- Good-quality bricks should not absorb more than 20% of their dry weight.
- Lower absorption indicates better quality and durability.

Experiment 5
Field Tests on Masonry Blocks

1. Shape, Size and Colour
2. Soundness
3. Density
4. Cracks
5. Hardness
6. Water absorption test

1. Shape Test

Purpose:

To check whether the block has a **uniform, rectangular shape** and **sharp edges**.

Procedure:

- Visually inspect each block.
- Place the block on a flat surface to check for wobble.
- Look for **cracks, chips, or warping**.

Expected Result:

- Block should have a **true rectangular shape** with **90° corners**.
- No visual cracks or deformation.

2. Size Test

Purpose:

To ensure block dimensions conform to **standard specifications** (e.g., 400×200×200 mm for solid blocks).

Procedure:

- Use a **measuring tape** or steel scale.
- Measure **length, width, and height** of a few blocks.

Expected Result:

- Dimensions should be within **±5 mm tolerance**.
- Uniformity across all blocks in a batch.

3. Texture Test

Purpose:

To examine the **surface finish** and ensure proper bonding with mortar.

Procedure:

- Feel the block surface with your hand.
- Check for **roughness, uniformity**, and presence of **dust or flaky material**.

Expected Result:

- Surface should be **moderately rough** and **free from loose particles**.
- Good texture ensures better bonding with mortar/plaster.

4. Density Test (Approximate Field Method)

Purpose:

To estimate whether the block has **sufficient compactness and strength**.

Procedure:

- Weigh the dry block using a **spring balance** or **digital scale**.
- Measure volume (Length × Width × Height in m^3).
- Use formula:

Density=Mass (kg)/Volume (m3)

Expected Result:

- For solid blocks: **>1800 kg/m^3**
- For hollow blocks: **1100–1400 kg/m^3**

5. Water Absorption Test

Purpose:

To assess the **porosity** and hence **durability** of the masonry block.

Procedure:

1. **Weigh the dry block** (W_1).
2. Soak the block in water for **24 hours**.
3. Remove, wipe off excess water, and weigh again (W_2).
4. Use formula:

Water Absorption (%)=W2−W1W1×100

Expected Result:

- **Fly ash bricks**: <10%
- **Concrete blocks**: <15%
- High absorption → lower durability

Summary Table:

Test	Good Result	Unsuitable if...
Shape	Rectangular, straight edges	Cracks, distortion, warping
Size	Within ±5 mm of standard size	Uneven, undersized or oversized
Texture	Moderately rough, dust-free	Very smooth or flaky
Density	>1800 kg/m³ (solid), >1100 kg/m³ (hollow)	Very light or fragile
Water Absorption	<10–15%	Absorption >20%

Experiment 6
Identification and Applications of Natural Timbers and Industrial Timbers

Teak, Rose, Honne, Jackfruit, Mango, Neem, Silver oak, Matti, Nandi, and Casuarina, Veneers, Plywood, Fiber board, Hardboard, Block board and Laminated sheets

1. Natural Timbers

Teak

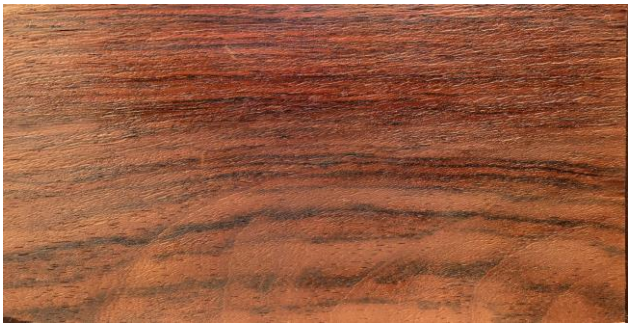
Identification:

- Golden to medium brown heartwood, sometimes with darker streaks.
- Straight, wavy, or interlocked grain patterns.
- High oil content makes it water-resistant and termite-resistant.
- Hard, heavy, and durable with a smooth texture when polished.

Applications:

- Luxury furniture, boat decking, flooring, doors, and window frames.
- Outdoor structures, garden furniture, and high-end paneling.
- Carvings and veneers for decorative purposes.

Rosewood



Identification:

- Dark reddish-brown with black streaks; lustrous surface.
- Heavy, hard, and fine-textured wood.
- Often oily, giving it natural polish and resistance to decay.

Applications:

- Musical instruments (guitars, pianos), premium furniture, and decorative veneers.
- Wood carving, inlay work, and luxury interior décor.

Honne

Identification:

- Reddish-brown wood with coarse, interlocked grain.
- Moderately hard, strong, and durable.
- Slightly oily surface, resistant to termites.

Applications:

- Structural beams, heavy carpentry, door and window frames.
- Flooring and wooden scaffolding in some regions.

Jackfruit

Identification:

- Yellowish heartwood with fine to medium texture.
- Straight grain, moderate hardness, and durability.
- Lightweight compared to hardwoods; smooth surface when polished.

Applications:

- Interior furniture, paneling, doors, and window frames.
- Decorative woodwork and low-cost flooring.

Mango

Identification:

- Pale to light brown wood, sometimes with darker streaks.
- Soft and less dense, medium hardness.
- May warp if not seasoned properly.

Applications:

- Affordable furniture, plywood cores, packing boxes, and temporary structures.
- Wooden crafts, carving, and low-cost cabinetry.

Neem

Identification:

- Light to reddish-brown with coarse or interlocked grain.
- Naturally termite-resistant due to chemical oils.
- Moderately hard and durable for structural purposes.

Applications:

- Doors, windows, furniture, agricultural implements, and fence posts.
- Panels, light flooring, and rural construction.

Silver Oak

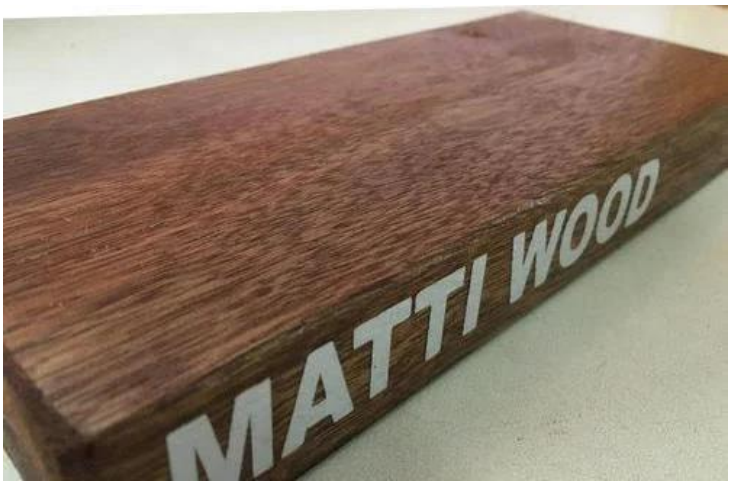
Identification:

- Light-colored, straight-grained wood.
- Moderately soft and easy to work with.
- Smooth texture, less dense than hardwoods.

Applications:

- Furniture, interior joinery, veneers, and lightweight construction.
- Decorative panels and wall cladding.

Matti



Identification:

- Dense, heavy, dark brown wood.
- Very strong, durable, and hard to work with.
- Resistant to wear and mechanical stress.

Applications:

- Heavy-duty structural work, beams, sleepers, and flooring.
- Outdoor constructions requiring durability.

Nandi

Identification:

- Hard, dark wood with strong mechanical properties.
- Dense and durable; less prone to decay.

Applications:

- Load-bearing structural members, pillars, and posts.
- Bridges, beams, and heavy carpentry.

Casuarina

Identification:

- Light-colored, straight-grained, and less dense.
- Fast-growing softwood, easy to handle.
- Moderate durability.

Applications:

- Poles, scaffolding, lightweight construction.
- Temporary structures, garden trellises, and fence posts.

2. Industrial Timbers

Veneers

Identification:

- Thin slices of natural wood (0.5–3 mm thick).
- Can be rotary-cut or sliced; retains natural grain.
- Flexible and adhesive-bonded to substrates.

Applications:

- Decorative surfaces on plywood, block boards, and MDF.
- Luxury furniture, paneling, wall cladding, and inlays.

Plywood

Identification:

- Layers (plies) of veneer glued together with grains at right angles.
- Uniform panel form with cross-laminated structure.

Applications:

- Doors, partitions, shuttering, furniture, floor decking.

Fibre Board (like MDF)

Identification:

- Made from wood fibers pressed with adhesive.
- Smooth, uniform texture, no visible grain.

Applications:

- Interior panels, cabinets, mouldings, acoustic boards.

Hardboard

Identification:

- Dense, smooth-surfaced board from compressed fibres.
- One side may be smooth, other rough.

Applications:

- Back panels, drawer bottoms, packaging, furniture backing.

Block Board

Identification:

- Core of wooden strips (blocks) with veneers on both faces.
- Lighter than solid wood but strong.

Applications:

- Table tops, doors, wall panels, shelves.

Laminated Sheets

Identification:

- Layers of resin-impregnated decorative papers bonded over a board.
- Smooth, coloured, decorative finish.

Applications:

- Kitchen counters, cabinets, wall paneling, decorative surfaces.

Experiment 6
Identification and Applications of Roofing Materials

Mangalore tiles, Country tiles, Asbestos Cement sheet, Galvanized Iron sheets, Roof Shingles, PUF sandwiched roofing sheets, UPVC sheets, Poly-carbonate sheets, Meta Colour sheets and Proflex sheets

1. Mangalore Tiles

Identification:

- Made of high-quality clay, kiln-fired for strength.
- Curved “S” shape allows water runoff.
- Porous surface provides natural ventilation.
- Can be coated with weatherproof paint for durability.

Applications:

- Traditional and modern residential buildings.
- Suitable for hilly or coastal regions due to good water drainage.
- Used in heritage and conservation projects.
- Eco-friendly roofing with natural insulation properties.

2. Country Tiles

Identification:

- Handmade, thicker than machine-made tiles.
- Irregular shape adds rustic aesthetic appeal.
- Strong and durable; less prone to cracking in extreme weather.

Applications:

- Rural houses, farmhouses, and cottages.
- Traditional architecture and heritage restoration.
- Provides natural ventilation, reducing indoor heat.
- Long-lasting in tropical and semi-arid regions.

3. Asbestos Cement Sheets

Identification:

- Fiber-reinforced cement, smooth or corrugated finish.
- Lightweight, brittle, and non-combustible.
- Resistant to termites, fire, and fungal attacks.
- Available in various thicknesses (5–10 mm).

Applications:

- Industrial sheds, warehouses, and garages.
- Low-cost roofing in rural and industrial areas.
- Fireproof roofing for high-risk zones.
- Temporary shelters and agricultural buildings.

4. Galvanized Iron (GI) Sheets

Identification:

- Steel sheets coated with zinc to prevent rusting.
- Available in corrugated, trapezoidal, or plain forms.
- Durable, strong, and lightweight.
- Can be painted or coated with polymer for color finish.

Applications:

- Industrial buildings, factories, and warehouses.
- Quick assembly roofing for sloping roofs.
- Rainwater harvesting structures.
- Coastal areas if coated properly to resist corrosion.

5. Roof Shingles

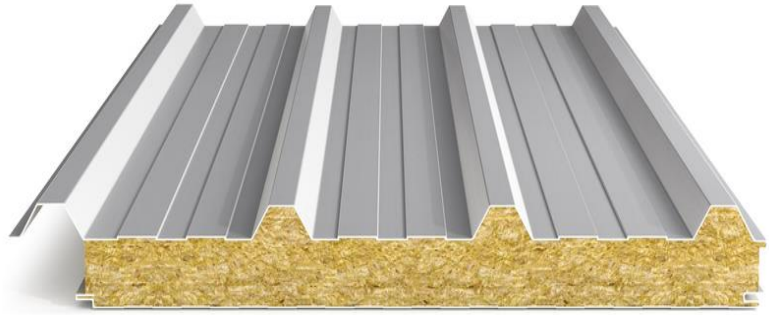
Identification:

- Made of asphalt, fiberglass, wood, or metal.
- Small, flat, and overlapping units.
- Resistant to rain, wind, and moderate fire.
- Available in various colors and textures.

Applications:

- Residential houses, villas, and small commercial buildings.
- Sloping roofs for aesthetic appeal and water runoff.
- Used in climates with heavy rainfall for leak prevention.
- Provides thermal insulation and soundproofing.

6. PUF (Polyurethane Foam) Sandwiched Roofing Sheets



Identification:

- Composite panels with insulating PUF core and metal sheets.
- Excellent thermal insulation and noise reduction.
- Lightweight, durable, and fire-retardant.
- Available in various thicknesses for cold storage or factories.

Applications:

- Cold storage rooms, warehouses, and factories.
- Industrial and commercial roofing requiring insulation.
- Prefabricated buildings and modular construction.
- Reduces energy costs by maintaining internal temperature.

7. UPVC Sheets

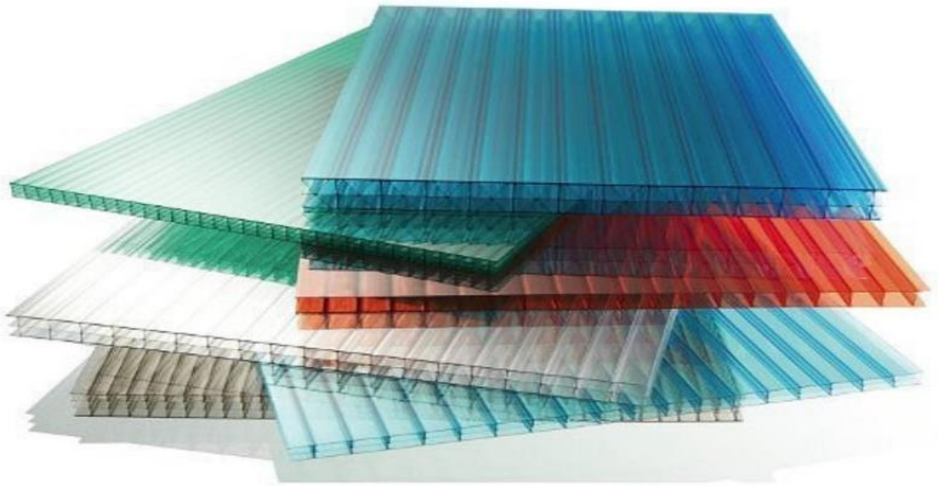
Identification:

- Plastic sheets made from unplasticized PVC.
- Lightweight, corrosion-resistant, and UV-protected.
- Semi-transparent or colored; smooth surface.
- Easy to cut, handle, and install.

Applications:

- Greenhouses, patios, carports, and sheds.
- Rainwater protection while allowing light penetration.
- Maintenance-free and chemical-resistant roofing.
- Ideal for coastal and industrial environments.

8. Polycarbonate Sheets



Identification:

- High-strength, transparent or translucent plastic.
- Lightweight, impact-resistant, UV-protected.
- Flexible and can be used in curved roofing.
- Available in single or multi-wall sheets for insulation.

Applications:

- Skylights, verandas, bus stops, industrial roofs.
- Let natural light in while protecting against UV and rain.
- Suitable for areas requiring impact resistance (hail, storms).
- Used in conservatories and urban buildings.

9. Meta Colour Sheets

Identification:

- Color-coated steel or aluminum sheets.
- Durable, corrosion-resistant, lightweight.
- Smooth surface with aesthetic metallic finish.
- Available in corrugated, trapezoidal, or flat profiles.

Applications:

- Industrial sheds, warehouses, and commercial buildings.
- Low-maintenance, long-lasting, and visually appealing.
- Quick assembly for pre-engineered buildings.
- Suitable for tropical and coastal areas with protective coating.

10. Proflex Sheets

Identification:

- Fiber-reinforced polymer sheets, flexible and lightweight.
- Water- and corrosion-resistant; fire-retardant properties.
- Available in various colors and thicknesses.
- Easy to install, durable, and resistant to harsh weather.

Applications:

- Residential houses, commercial roofing, coastal buildings.
- Suitable for sloped or curved roofing structures.
- Provides long-lasting protection against heavy rainfall.
- Used in lightweight temporary shelters or modular buildings.

Experiment 8

Identification and Applications of Cladding Materials

Stone Cladding, UPVC Cladding, Tile Cladding, Glass Cladding, Composite Cladding, Aluminium Cladding, Brick Cladding, Wood Cladding and Metal Cladding

1. Stone Cladding

Identification:

- Natural stone pieces (slate, granite, marble, limestone, sandstone).
- Can be rough, polished, or honed.
- Heavy, durable, fire-resistant, and weather-resistant.

Applications:

- Exterior and interior walls, facades, and pillars.
- Landscaping, garden walls, and retaining walls.
- Provides natural aesthetics, durability, and thermal insulation.

2. UPVC Cladding

Identification:

- Lightweight plastic panels made of unplasticized polyvinyl chloride.
- Available in various colors, finishes, and textures.
- Water-proof, termite-resistant, and low-maintenance.

Applications:

- Interior walls, false ceilings, and wet areas (bathrooms, kitchens).
- Exterior facades in coastal or humid regions.
- Quick installation for residential, commercial, and industrial buildings.

3. Tile Cladding

Identification:

- Ceramic, porcelain, or natural stone tiles fixed on walls or facades.
- Available in multiple sizes, colors, textures, and finishes (glossy, matte, rustic).
- Durable, fire-resistant, and easy to clean.

Applications:

- Exterior walls, bathrooms, kitchens, and swimming pool surrounds.
- Decorative facades, commercial buildings, and hotels.
- Provides aesthetic appeal, weather protection, and low maintenance.

4. Glass Cladding

Identification:

- Tempered, laminated, or reflective glass panels.
- Transparent, translucent, or tinted options.
- Lightweight, modern aesthetic, and allows natural light.

Applications:

- Commercial buildings, high-rise facades, curtain walls.
- Skylights, atriums, partitions, and interior walls.
- Enhances natural lighting, energy efficiency, and modern aesthetics.

5. Composite Cladding

Identification:

- Made from a combination of materials (metal, plastic, wood fibers).
- Lightweight, durable, and available in panels or sheets.
- Resistant to weather, UV rays, and termites.

Applications:

- Commercial and residential facades, office interiors, and high-rise buildings.
- False ceilings, wall panels, and decorative exterior surfaces.
- Offers modern finishes with low maintenance and long lifespan.

6. Aluminium Cladding

Identification:

- Lightweight metal panels made of aluminum sheets, often powder-coated or anodized.
- Smooth or textured finishes; corrosion-resistant.
- Can be flat, corrugated, or perforated.

Applications:

- Exterior facades, curtain walls, window frames, and commercial buildings.
- Industrial buildings, false ceilings, and soffits.
- Modern, sleek aesthetics with long-lasting performance.

7. Brick Cladding

Identification:

- Thin brick veneers or panels fixed on walls.
- Natural red, brown, or painted bricks; rustic or smooth finish.
- Provides the appearance of masonry without structural weight.

Applications:

- Exterior and interior walls, facades, and fireplaces.
- Commercial buildings, residential houses, and heritage-style architecture.
- Adds aesthetic appeal, insulation, and durability.

8. Wood Cladding

Identification:

- Timber planks, panels, or engineered wood sheets (like cedar, teak, or treated softwood).
- Natural grain, warm finish, and can be treated for weather resistance.
- Lightweight, eco-friendly, and can be painted or varnished.

Applications:

- Residential and commercial exteriors, interior accent walls.
- Decking, pergolas, and false ceilings.
- Provides natural aesthetics, thermal insulation, and acoustic benefits.

9. Metal Cladding

Identification:

- Panels made of steel, zinc, copper, or other metals.
- Corrugated, flat, perforated, or profile sheets.
- Durable, weather-resistant, fire-resistant, and recyclable.

Applications:

- Industrial buildings, warehouses, commercial facades, and roofs.
- Accent walls, partitions, and high-rise cladding.
- Provides long-lasting protection with modern industrial aesthetics.

Experiment 9
Identification and Applications of Flooring Materials

Marble, Granite, Vitrified Tiles, Ceramic tiles, Pressed Clay tiles, Cement concrete with red-oxide finish, Interlocking pavers, Wooden flooring, Shahabad stone flooring, Italian Marble, and Anti-skid tiles.

1. Marble

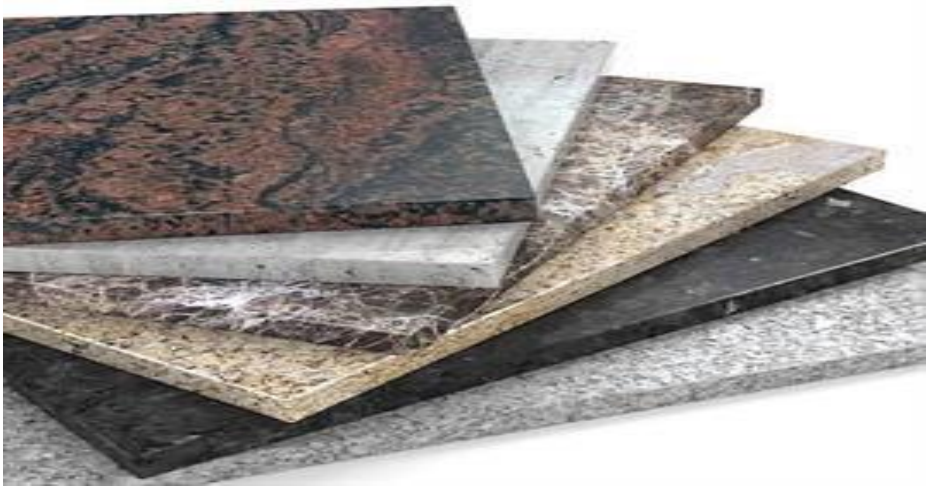
Identification:

- Natural metamorphic stone with fine, crystalline texture.
- Available in white, cream, green, black, or multicolored veins.
- Polished surface gives glossy finish; smooth and cool underfoot.

Applications:

- Living rooms, lobbies, and corridors.
- Flooring, staircases, wall cladding, and decorative panels.
- Luxury interiors and hotels due to aesthetic appeal.

2. Granite



Identification:

- Hard, dense igneous rock with coarse grains.
- Available in black, gray, pink, or speckled textures.
- Highly durable, scratch-resistant, and polished for smooth finish.

Applications:

- Heavy-duty flooring in commercial, industrial, and outdoor areas.
- Kitchen countertops, staircases, public spaces, and pavements.
- Ideal for areas requiring high wear resistance.

3. Vitrified Tiles

Identification:

- Manufactured ceramic tiles with low porosity and high density.
- Smooth, glossy surface; available in polished, matte, or textured finishes.
- Strong, water-resistant, and easy to maintain.

Applications:

- Residential, commercial, and office flooring.
- Bathrooms, kitchens, and corridors.
- Modern interiors with aesthetic appeal and easy maintenance.

4. Ceramic Tiles

Identification:

- Made from clay, glazed or unglazed; medium hardness.
- Smooth or textured finish; variety of colors and patterns.
- Water-resistant but less hard than vitrified tiles.

Applications:

- Kitchens, bathrooms, and wall cladding.
- Light-traffic residential and commercial flooring.
- Decorative finishes and easy cleaning areas.

5. Pressed Clay Tiles

Identification:

- Natural clay tiles, rectangular or square, compressed and kiln-fired.
- Rough texture; earthy red or brown color.
- Porous but durable if properly sealed.

Applications:

- Traditional flooring in courtyards, verandahs, and rural houses.
- Rustic and eco-friendly interiors.
- Outdoor walkways and low-traffic areas.

6. Cement Concrete with Red-Oxide Finish

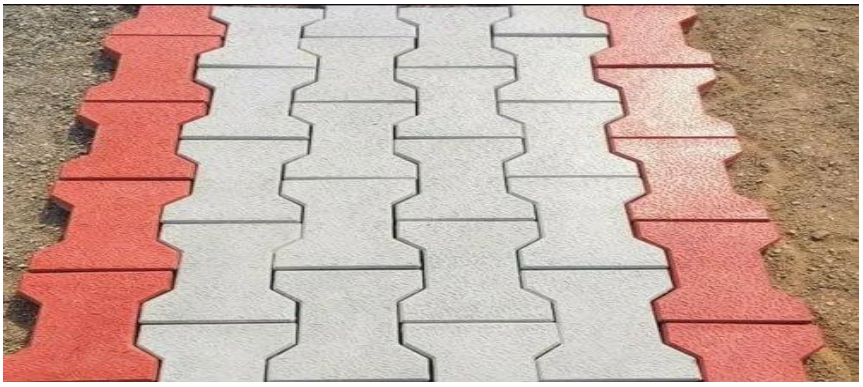
Identification:

- Plain cement concrete floor with a red-oxide layer on top.
- Smooth, polished, and colored surface; can be plain or patterned.
- Hard, durable, and cost-effective.

Applications:

- Residential houses, verandahs, and offices.
- Industrial and institutional flooring.
- Provides aesthetic red finish with high durability.

7. Interlocking Pavers



Identification:

- Pre-cast concrete blocks shaped to interlock.
- Available in various colors, patterns, and thicknesses.
- Durable, load-bearing, and slip-resistant.

Applications:

- Roads, pavements, driveways, parking areas, and garden paths.
- Outdoor commercial spaces and industrial yards.
- Quick installation and maintenance-free flooring solution.

8. Wooden Flooring

Identification:

- Natural timber planks or engineered wood sheets.
- Warm finish, natural grains, and moderate hardness.
- Can be polished, varnished, or laminated.

Applications:

- Residential bedrooms, living rooms, and offices.
- Luxury interiors, hotels, and decorative floors.
- Provides natural aesthetics, thermal insulation, and comfort underfoot.

9. Shahabad Stone Flooring

Identification:

- Dense, fine-grained, dark-colored stone.
- Smooth surface with high compressive strength.
- Traditional Indian flooring material.

Applications:

- Residential and institutional buildings in India.
- Courtyards, verandahs, and flooring in humid regions.
- Durable, easy to maintain, and long-lasting.

10. Italian Marble

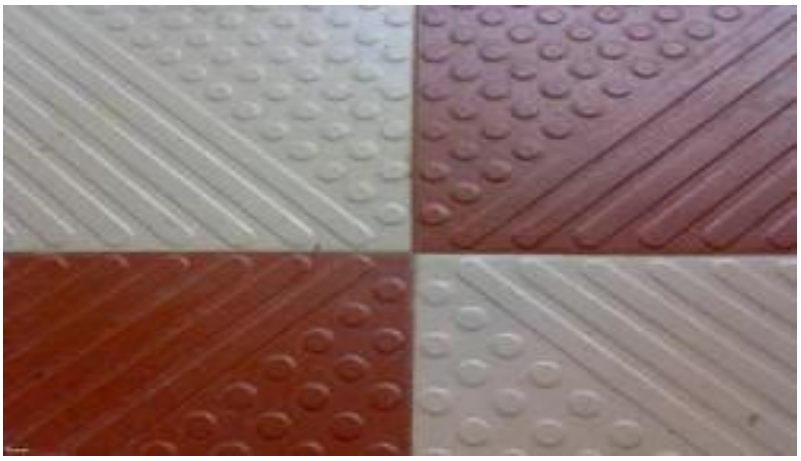
Identification:

- Premium marble imported from Italy.
- Distinctive veining, high polish, and luxurious finish.
- Smooth, hard, and aesthetically appealing.

Applications:

- High-end residential flooring, hotels, and commercial lobbies.
- Wall cladding, staircases, and decorative panels.
- Luxury interiors requiring elegance and premium quality.

11. Anti-Skid Tiles



Identification:

- Tiles with rough, textured surface to prevent slipping.
- Available in ceramic, vitrified, or stone varieties.
- Water-resistant, durable, and often matte-finished.

Applications:

- Bathrooms, kitchens, terraces, and swimming pool areas.
- Public spaces, hospitals, and schools.
- Safety flooring in wet or high-traffic areas.

Experiment 10
Identification and applications of Paints and Coats

Wall Putty, lime Distemper, Emulsion Paint, Enamel Paint, Cement paint, Aluminium Paint, Anti-Corrosive Paint, Water Proofing Paints, Thermoplastic paint. Primer (wall, metal, and wood) Varnish materials.

1. Wall Putty

Identification:

- Fine, powdery material mixed with water to form a smooth paste.
- Usually white or off-white in color.
- Applied as a base coat on walls to create a smooth surface.

Applications:

- Interior and exterior walls before painting.
- Fills cracks, minor imperfections, and uneven surfaces.
- Improves paint adhesion and enhances finish durability.

2. Lime Distemper

Identification:

- Made from slaked lime, pigments, and water.
- Matte finish; smooth texture; low-cost.
- Eco-friendly but less water-resistant.

Applications:

- Interior walls of low-cost housing, schools, and offices.
- Provides uniform color and smooth finish for walls.
- Suitable for dry interiors; can be applied on plastered walls.

3. Emulsion Paint

Identification:

- Water-based paint with synthetic resins (acrylic, vinyl, or latex).
- Available in matte, silk, or glossy finishes; quick-drying.
- Easy to apply, low odor, and environmentally friendly.

Applications:

- Interior and exterior walls of residential, commercial, and institutional buildings.
- Ceilings, partitions, and decorative finishes.
- Provides smooth finish, washable surfaces, and wide color range.

4. Enamel Paint

Identification:

- Oil-based or synthetic resin paint.
- Glossy or semi-gloss finish; hard, durable, and water-resistant.
- Available in various colors.

Applications:

- Metal surfaces, doors, windows, grills, and furniture.
- Exterior and interior walls needing glossy or durable finish.
- Suitable for high-traffic areas and protective coating.

5. Cement Paint

Identification:

- Made from white or grey cement, pigments, and additives.
- Powder form mixed with water before application.
- Matte finish; water-resistant, alkali-resistant, and durable.

Applications:

- Exterior walls, concrete surfaces, boundary walls, and facades.
- Protective coating on plastered walls against weathering.
- Ideal for humid or rainy climates.

6. Aluminium Paint

Identification:

- Paint containing finely powdered aluminum or metallic flakes.
- Silver or metallic finish; reflective and decorative.
- Provides corrosion resistance.

Applications:

- Metal structures, doors, windows, and machinery.
- Industrial applications where reflective or metallic finish is needed.
- Protective coating against rust and heat.

7. Anti-Corrosive Paint

Identification:

- Contain pigments and inhibitors to prevent rust.
- Usually applied on metal surfaces; available in primer or topcoat forms.
- Durable, water-resistant, and chemical-resistant.

Applications:

- Metal pipes, tanks, machinery, bridges, and industrial structures.
- Protects iron, steel, and other metals from corrosion.

8. Waterproofing Paints

Identification:

- Resin or cement-based paints with water-repellent properties.
- Flexible, durable, and resistant to dampness.
- Available in various colors and textures.

Applications:

- Roofs, terraces, bathrooms, and water tanks.
- Exterior walls in rainy regions.
- Prevents seepage and water damage.

9. Thermoplastic Paint

Identification:

- Paint containing thermoplastic resin; forms tough, durable coating when heated.
- Smooth, glossy, and flexible.
- Heat- or flame-applied on road markings or surfaces.

Applications:

- Road marking lines, parking areas, and industrial floors.
- Provides high visibility and wear-resistant finish.

10. Primer (Wall, Metal, and Wood)

Identification:

- Base coat applied before final paint.
- Wall primer: water-based; improves adhesion of top coats.
- Metal primer: anti-corrosive; protects against rust.
- Wood primer: seals pores and prevents resin bleeding.

Applications:

- Prepares surface for paint, increases durability, and enhances finish.
- Required for walls, doors, metal surfaces, and wooden furniture.
- Reduces topcoat consumption and ensures uniform color.

11. Varnish Materials

Identification:

- Transparent or semi-transparent resinous coating.
- Glossy or matte finish; protects wood from moisture, scratches, and UV rays.
- Can be spirit-based or water-based.

Applications:

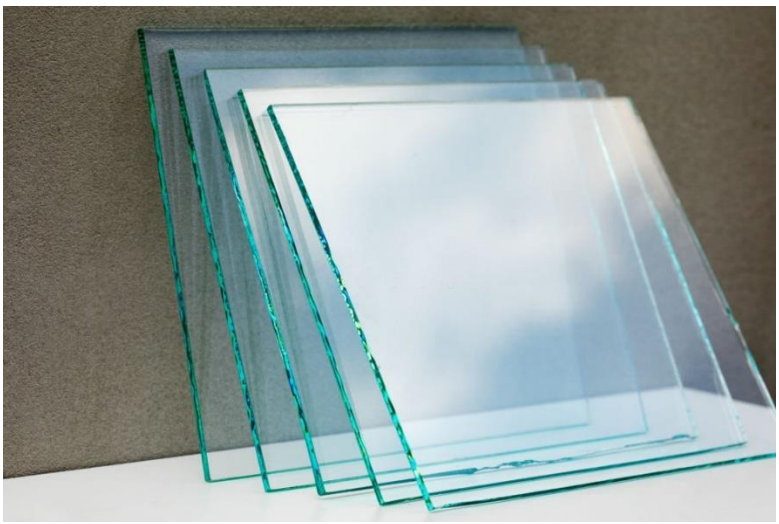
- Wooden furniture, doors, panels, and decorative woodwork.
- Preserves natural wood texture while providing protective coating.
- Used in interiors and exteriors to enhance aesthetics and durability.

Experiment 11

Identification and applications of Glass Materials

Glass panels- Plain, Dark cool, Brown cool, printed, Wired glass, Perforated glass, Float glass, Toughened glass, and Glass bricks.

1. Plain Glass



Identification:

- Transparent, colorless, flat glass with smooth surface.
- Available in different thicknesses.
- Brittle; breaks into sharp pieces.

Applications:

- Windows, partitions, doors, and showcases.
- Picture frames and furniture tops.
- General glazing in residential and commercial buildings.

2. Dark Cool Glass

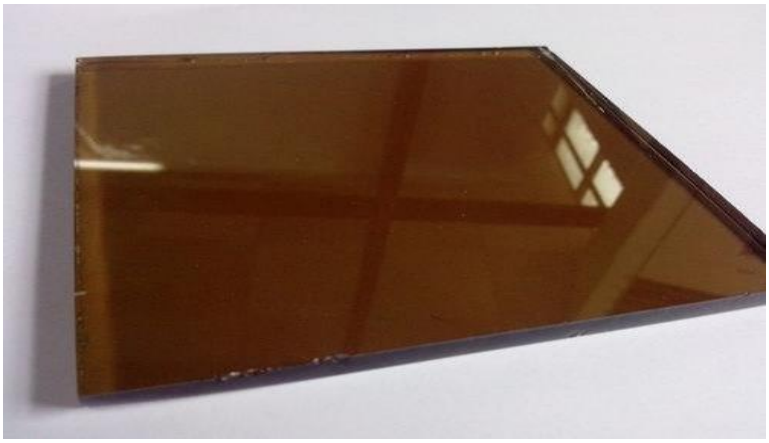
Identification:

- Tinted glass, usually gray or blue, with reduced sunlight transmission.
- Smooth, reflective surface; reduces glare.

Applications:

- Windows, façades, and skylights in sunny areas.
- Commercial buildings to reduce heat and enhance energy efficiency.
- Decorative glazing in interiors.

3. Brown Cool Glass



Identification:

- Brown-tinted glass; smooth and reflective.
- Reduces glare and absorbs solar heat.

Applications:

- Commercial and residential windows and facades.
- Sunrooms and curtain walls to control light and heat.
- Aesthetic enhancement in modern architecture.

4. Printed Glass

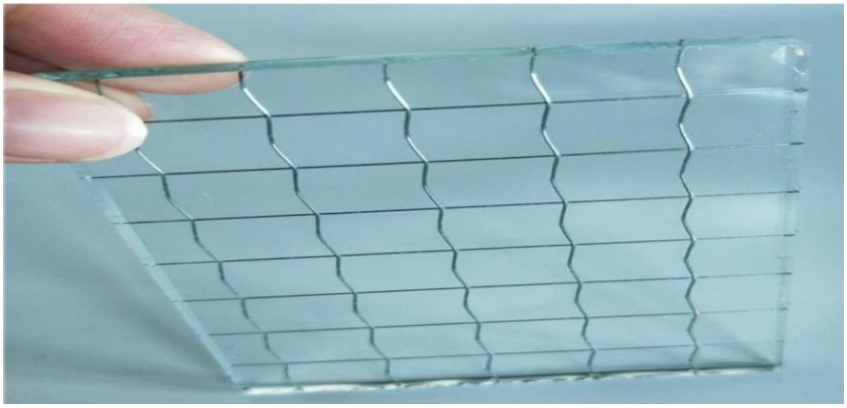
Identification:

- Glass with patterns, textures, or designs printed on surface.
- Can be opaque, translucent, or semi-transparent.
- Decorative and functional, providing privacy.

Applications:

- Interior partitions, decorative walls, doors, and showers.
- Office cubicles, hotels, restaurants, and retail interiors.
- Provides visual appeal and partial privacy.

5. Wired Glass



Identification:

- Embedded with a wire mesh for reinforcement.
- Provides additional safety; holds shards in place if broken.
- Opaque or translucent; fire-resistant properties.

Applications:

- Fire doors, windows in factories, and schools.
- Industrial buildings and areas requiring safety glazing.
- Protective barriers and skylights.

6. Perforated Glass

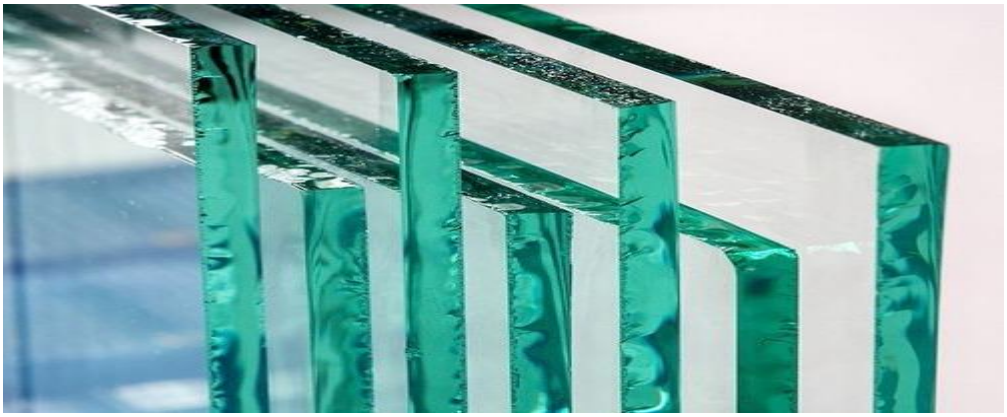
Identification:

- Glass with small holes or patterns cut into surface.
- Decorative, semi-transparent; can diffuse light.
- Lightweight and aesthetically unique.

Applications:

- Interior partitions, facades, skylights, and decorative panels.
- Acoustic panels and light diffusers.
- Modern architectural designs and feature walls.

7. Float Glass



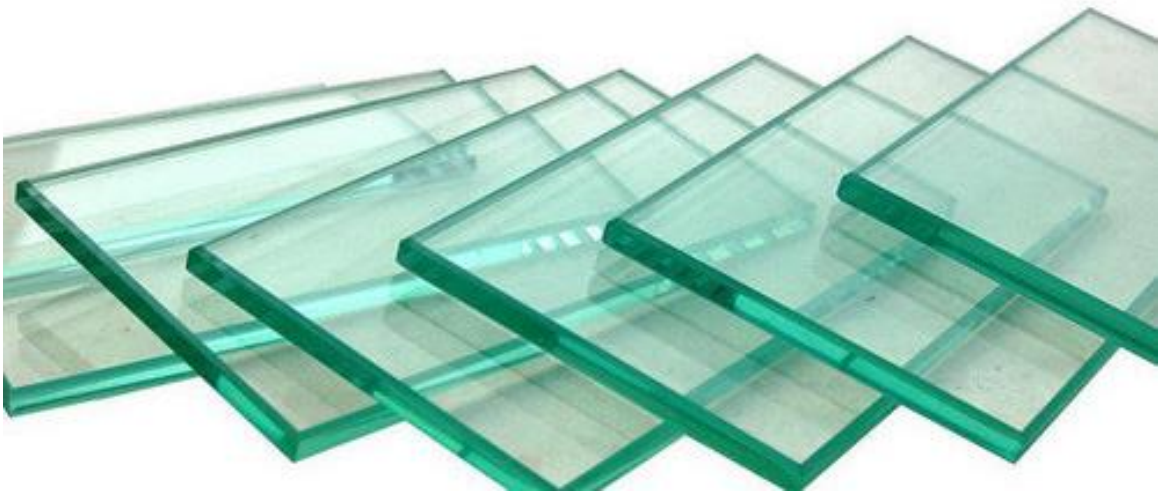
Identification:

- Produced by floating molten glass on molten tin.
- Uniform thickness, flat, and smooth surface.
- Standard transparent glass used as base material.

Applications:

- Windows, doors, mirrors, and furniture tops.
- Base material for laminated, toughened, or reflective glass.
- General glazing and architectural purposes.

8. Toughened Glass (Tempered Glass)



Identification:

- Heat-treated glass, 4–5 times stronger than normal glass.
- Breaks into small, blunt pieces for safety.
- Smooth, glossy surface; can be clear, tinted, or laminated.

Applications:

- Shower enclosures, glass doors, staircases, and balconies.
- Automobile windows, facades, and skylights.
- Safety glazing where impact resistance is needed.

9. Glass Bricks

Identification:

- Thick, hollow, transparent or translucent blocks.
- Can be clear, frosted, or colored; allows light transmission but maintains privacy.
- Strong and durable; can be load-bearing in walls.

Applications:

- Partition walls, facades, decorative walls, and skylights.
- Bathrooms, staircases, and feature walls.
- Provides daylight while maintaining privacy and aesthetic appeal.

Experiment 12
Identification and Applications of Sustainable Materials

Demolition wastes, Re-cycled materials, Bamboo, CSEB, Certified wood, Earth packed tyres, newspaper compressed wood, recycled glass, earth bags, Cob, Cork (brick & wood), Adobe brick, straw bale, and mycelium.

1. Demolition Wastes

Identification:

- Materials obtained from deconstructed or demolished buildings.
- Includes concrete, bricks, steel, timber, and tiles.
- Can be crushed, sorted, and reused.

Applications:

- Road base, pavements, and landscaping.
- Recycled aggregate for new concrete or construction fill.
- Reduces landfill waste and environmental impact.

2. Recycled Materials

Identification:

- Processed waste materials reused in construction.
- Can include plastics, metals, glass, and composites.
- Often treated to improve durability and safety.

Applications:

- Flooring tiles, insulation, panels, and road surfacing.
- Prefabricated building components.
- Eco-friendly construction projects.

3. Bamboo

Identification:

- Fast-growing grass with hollow cylindrical stems.
- Lightweight, flexible, and high tensile strength.
- Can be treated to resist pests and decay.

Applications:

- Scaffolding, flooring, furniture, roofing, and wall panels.
- Lightweight structures, bridges, and eco-houses.
- Decorative panels and handicrafts.

4. CSEB (Compressed Stabilized Earth Blocks)

Identification:

- Earth blocks stabilized with cement or lime, compressed in molds.
- Uniform size and strong; eco-friendly and low-cost.
- Can be used as structural or non-structural units.

Applications:

- Walls of residential and low-rise buildings.
- Institutional and community structures.
- Reduces use of fired bricks and carbon footprint.

5. Certified Wood

Identification:

- Timber sourced from sustainably managed forests.
- Certified by FSC or other agencies; ensures legal and sustainable harvest.
- Can be hardwood or softwood, treated for durability.

Applications:

- Furniture, doors, windows, flooring, and paneling.
- Structural and decorative elements in sustainable construction.
- Eco-friendly residential and commercial projects.

6. Earth-Packed Tyres

Identification:

- Old tyres filled with earth or compacted soil.
- Heavy, durable, and excellent thermal mass.
- Provides structural stability for walls or foundations.

Applications:

- Earthship-style houses, retaining walls, and berms.
- Sustainable low-cost housing.
- Thermal insulation in passive building designs.

7. Newspaper Compressed Wood (Papercrete / Paper Blocks)

Identification:

- Waste paper compressed with cement, clay, or lime.
- Lightweight, insulating, and low-cost material.
- Can be molded into blocks or panels.

Applications:

- Partition walls, low-cost houses, and acoustic panels.
- Lightweight interior panels and insulation.
- Eco-friendly furniture and decorative elements.

8. Recycled Glass

Identification:

- Glass crushed and reprocessed from post-consumer waste.
- Can be used as aggregate, tiles, or decorative elements.
- Transparent or colored, durable, and inert.

Applications:

- Flooring tiles, countertops, wall panels, and terrazzo flooring.
- Decorative concrete or glass mosaics.
- Road surfaces and pavements as aggregate.

9. Earth Bags

Identification:

- Polypropylene or burlap bags filled with soil, sand, or aggregate.
- Stacked and tamped to form walls.
- Highly durable and low-cost, with excellent thermal mass.

Applications:

- Low-cost housing, boundary walls, and community structures.
- Earthquake-resistant or disaster relief shelters.
- Sustainable, eco-friendly construction projects.

10. Cob

Identification:

- Mixture of clay, sand, straw, and water.
- Hand-molded and dried naturally; no fired bricks required.
- Strong in compression, breathable, and eco-friendly.

Applications:

- Walls, interior partitions, and rural housing.
- Traditional and natural construction methods.
- Decorative walls and eco-homes.

11. Cork (Brick & Wood)

Identification:

- Made from bark of cork oak trees; lightweight and compressible.
- Natural insulation, moisture-resistant, and fire-retardant.
- Available as bricks, tiles, or panels.

Applications:

- Flooring, wall panels, insulation, and acoustic treatment.
- Eco-friendly furniture and decorative elements.
- Thermal and sound insulation in sustainable buildings.

12. Adobe Brick

Identification:

- Sun-dried bricks made from clay, sand, straw, and water.
- Rectangular, uniform, and lightweight.
- Low embodied energy and excellent thermal mass.

Applications:

- Residential walls, rural houses, and low-rise structures.
- Eco-friendly and energy-efficient construction.
- Restorations and heritage-style buildings.

13. Straw Bale

Identification:

- Compressed straw bales bound with twine or wire.
- Excellent insulation, lightweight, and biodegradable.
- Can be plastered with mud, lime, or cement.

Applications:

- Insulated walls in sustainable houses.
- Low-cost and energy-efficient residential construction.
- Eco-friendly architecture and natural homes.

14. Mycelium

Identification:

- Fungal root network grown on organic substrates.
- Lightweight, biodegradable, and insulating.
- Can be molded into panels, bricks, or packaging materials.

Applications:

- Insulation panels, partition walls, and decorative blocks.
- Eco-friendly packaging and lightweight construction.
- Experimental sustainable architecture and furniture.

Experiment 13
Identification and applications of Miscellaneous Materials

Metal paste, Epoxy resin, Epoxy water proofing, Silicon paste, Tile joint filler material, Sealants, Tar felt sheets, expanded metal strips for joints, Adhesives (for PVC, UPVC, Timber), Gypsum boards, Structural Steel Forms, and Powder coated Aluminium Materials

1. Metal Paste

Identification:

- Thick paste containing metallic particles mixed with resin or binder.
- Shiny metallic finish, available in silver, bronze, or gold.

Applications:

- Protective and decorative coatings on metals, wood, or concrete.
- Used for filling scratches, cracks, and surface defects.
- Provides corrosion resistance and metallic finish.

2. Epoxy Resin

Identification:

- Two-component material (resin + hardener) that cures into a hard solid.
- Transparent or tinted, with strong adhesive properties.

Applications:

- Flooring, coatings, adhesives, and composite materials.
- Electrical insulations and sealing cracks in structures.
- Used in construction, marine, and aerospace industries.

3. Epoxy Waterproofing

Identification:

- Special epoxy-based compound forming a water-resistant barrier.
- Available as coatings or liquid membranes.

Applications:

- Terrace, basement, and bathroom waterproofing.
- Sealing water tanks and pipelines.
- Protective coating against seepage and dampness.

4. Silicon Paste

Identification:

- Gel-like or paste form of silicone polymer.
- Water-repellent, flexible, and temperature resistant.

Applications:

- Waterproofing sealant for joints, tiles, and glass.
- Used in plumbing, glazing, and expansion joints.
- Provides elasticity and long-term durability.

5. Tile Joint Filler Material (Grout)

Identification:

- Cement-based or polymer-based powder mixed with water.
- Fills gaps between tiles; available in various colors.

Applications:

- Floor and wall tile joint finishing.
- Prevents water seepage and strengthens tile bond.
- Enhances durability and aesthetics of tiled surfaces.

6. Sealants

Identification:

- Flexible materials (silicone, polyurethane, acrylic, etc.) used for joints.
- Stays elastic after curing; comes in paste or cartridge form.

Applications:

- Filling expansion joints in buildings and pavements.
- Preventing leakage in plumbing, glazing, and roofing.
- Vibration and sound insulation.

7. Tar Felt Sheets

Identification:

- Bitumen-saturated felt sheets.
- Black, flexible, and waterproof sheets in rolls.

Applications:

- Roof waterproofing layers.
- Damp-proof course in foundations.
- Protective membrane in civil engineering works.

8. Expanded Metal Strips for Joints

Identification:

- Thin sheet of metal slit and stretched into mesh form.
- Lightweight, strong, and allows plaster adhesion.

Applications:

- Reinforcement for plaster and joints.
- Prevents cracks at wall–ceiling junctions.
- Used in false ceilings and concrete repairs.

9. Adhesives (for PVC, UPVC, Timber)

Identification:

- Chemical-based bonding materials in liquid or paste form.
- Specialized formulations for plastics or timber.

Applications:

- Joining pipes (PVC/UPVC) in plumbing.
- Carpentry and wood lamination.
- Fixing panels, laminates, and insulation boards.

10. Gypsum Boards

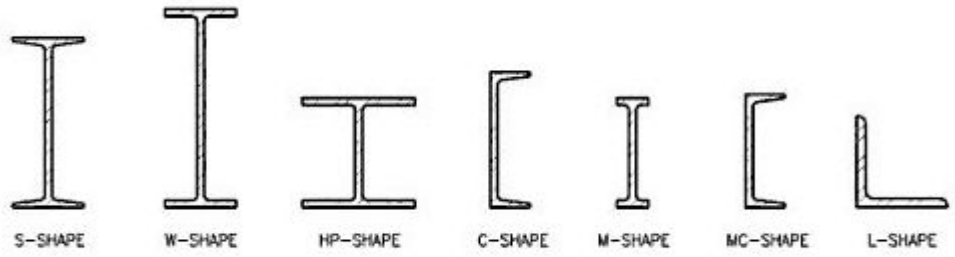
Identification:

- Prefabricated boards of gypsum plaster sandwiched between paper.
- Lightweight, smooth finish, available in panels.

Applications:

- False ceilings, partitions, and dry wall systems.
- Fire-resistant linings and sound insulation.
- Quick construction with smooth surface finish.

11. Structural Steel Forms



Identification:

- Prefabricated steel members in I, H, T, and L shapes.
- High strength, ductile, and uniform quality.

Applications:

- Beams, columns, bridges, and industrial structures.
- Multi-storey buildings and trusses.
- Heavy load-bearing structural frameworks.

12. Powder-Coated Aluminium Materials

Identification:

- Aluminium products coated with dry powder and cured with heat.
- Smooth, durable, and decorative finish.
- Resistant to corrosion, scratches, and fading.

Applications:

- Doors, windows, cladding, and curtain walls.
- Furniture, railings, and modular partitions.
- Exterior and interior decorative applications.