FALSE CEILING MATERIALS

Plaster of Paris (POP)

Gypsum oard

Mineral fibre

Metal ceiling

Natural panels

Extensively used material in false ceiling

Raw materials – wood fibers and magnesite gives off white color to fibrecrete natural panels.

Standard size – 2m x 1/2m, 1.22m x 0.61m

Thickness in mm – 6,13,15,20,25,40,50,75,100,150.

Density in kg/Cum – 400, 450, 600, 800

Cement finish panels

Extensively been used for roof insulation in all kinds of buildings external cabins such as

Time offices, security offices telephone booths

Our cement finish panels are cost effective and highly durable in nature.

PANELS OF LAMINATES

Laminate panel is a type of manufactured timber made from thin sheets of substrates or wood veneer.

It is similar to the more widely used plywood, except that it has a plastic, protective layer on one or both sides.

Laminate panels are used instead of plywood because of their,

- Resistance to impact
- Weather
- Moisture
- Shattering in cold (ductility),
- And chemicals.

Laminate panel layers (called veneers) are glued together with adjacent plies having their grain at right angles to each other for greater strength.

The plastic layer(s) added for protection vary in composition, thickness, color and texture according to the application.

Types

A number of varieties of laminate panel exist for different applications.

- Plywood + ABS laminate panels
- Plywood + FRP laminate panels
- Plywood + aluminum laminated panels
- Lightweight composite panels

Sizes

Most commonly used thickness range from 1/8" to 1/2" and 3/8", in a variety of colours and textures.

Applications

- Weather-proof,
- Impact resistant sheet material.

Typical end uses of spruce plywood are:

- Floors, walls and roofs in clean rooms
- Vehicle internal body work
- Packages and boxes
- Road cases

STEEL

Steel is the most suitable building material among metallic materials.

This is due to a wide range and combination of physical and mechanical properties that steels can have.

Fig. Forms of Steel

By suitably controlling the carbon content, alloying elements and heat treatment, a desired combination of hardness, ductility, and strength can be obtained in steel.

On the basis of carbon content steel may be classified as under:

Type of steel	Carbon content (%)	Uses
Mild steel	upto 0.10%	Motor body, sheet metal tin plate, etc.
Medium carbon steel	upto 0.25%	Boiler plates, structural steel, etc.
	upto 0.45%	Rails, tires, etc.
	upto 0.60%	Hammers, large stamping and pressing dies, etc.
High carbon steel	upto 0.75%	Sledge hammers, springs, stampling dies, etc.
or hard steel	upto 0.90%	Miner‘s drills, smith‘s tools, stone manson‘s tools, etc
	upto 1.00%	Chisels, hammers, saws, wood working tools, etc.
	upto 1.10%	Axes, cutlery, drills, knives, picks, punches, etc.

Properties and Uses

- Mild Steel (low carbon or soft steel).
- It is ductile, malleable; tougher and more elastic than wrought iron.
- Mild steel can be forged and welded, difficult to temper and harden.
- It rusts quickly and can be permanently magnetized.

properties are:

Specific gravity - 7.30,

Ultimate compressive - 800–1200 N/mm2

Tensile strengths - 600– 800 N/mm2.

Mild steel is used in the form of rolled sections, reinforcing bars, roof coverings and sheet piles and in railway tracks.

High Carbon Steel: (hard steel)

- Carbon content in high carbon steel varies from 0.55 to 1.50%. It is tougher and more elastic than mild steel.
- It can be forged and welded with difficulty.

properties are:
Specific gravity - 7.90.
Ultimate compressive - 1350 N/mm2
Tensile strengths - 1400–2000 N/mm2
High carbon steel is used for reinforcing cement concrete and prestressed concrete members. It can take shocks and vibrations and is used for making tools and machine parts.

High Tensile steel: (high strength steel)

The carbon content in high tensile steel is 0.6–0.8%, manganese 0.6%, silicon 0.2%, sulphur 0.05% and phosphorus 0.05%.
properties are:
Ultimate tensile strength - 2000 N/mm2
Minimum elongation - 10 per cent.High
Tensile steel is used in prestressed concrete construction.

Manufacturing Methods

The prominent steel-making processes are:
1. Bessemer process
2. Cementation process
3. Crucible process
4. Open Hearth process
5. Electric Smelting process
6. Duplex process
7. Lintz and Donawitz (L.D.) process

The most prominent present-day steel-making process is the Bessemer process was introduced in 1856. The pig iron is first melted in Cupola furnace and sent to Bessemer converter (Fig.) Blast of hot air is given to oxidize the carbon. Depending upon the requirement, some carbon and manganese is added to the converter and hot air is blasted once again. Then the molten material is poured into moulds to form ingots. L.D. process is Fig. Bessemer converter for the Manufacture of Steel modification of the Bessemer process in which there in no control over temperature. By this method steel can be made in hardly 25 minutes. In Open-hearth process also known as Siemen‘s-Martin process, the steel produced is more homogeneous than by Bessemer‘s. The electric process is costly but no ash or smoke is produced. The Crucible process involves melting of blister steel or bars of wrought iron in fire clay crucibles. Cast steel so obtained is very hard and is used for making surgical equipments. The Duplex process is a combination of Acid Bessemer process and Basic Open Hearth process

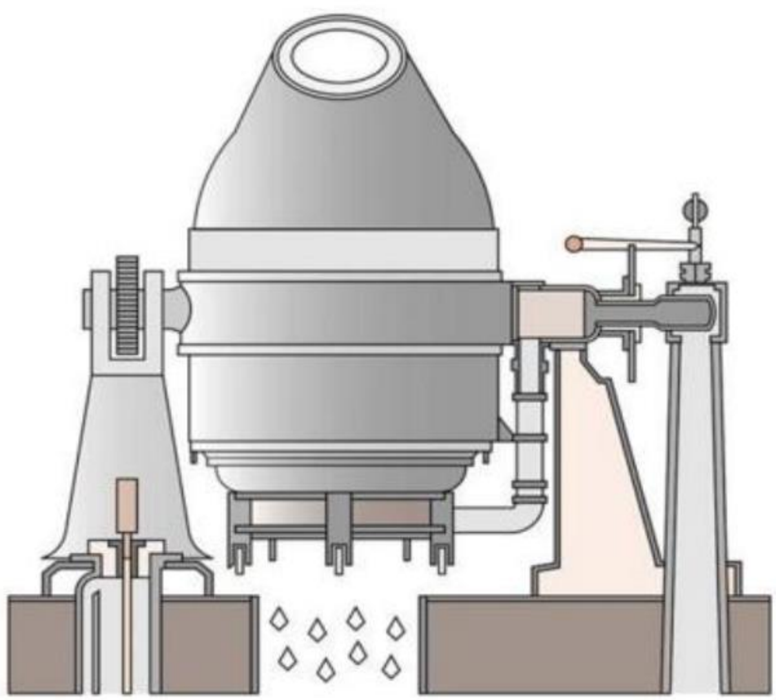


Fig. Bessemer process of steel manufacturing

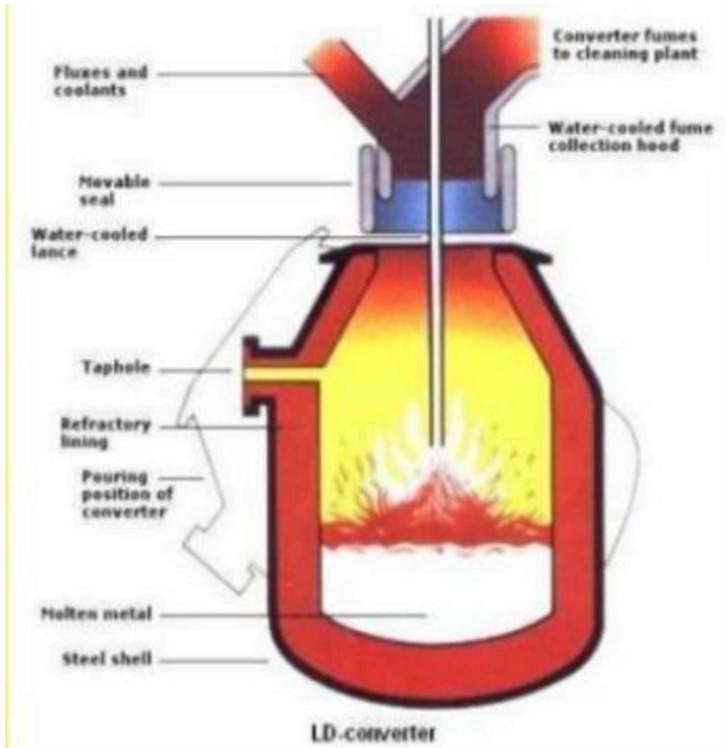


Fig. LD Convertor

ALUMINIUM COMPOSITE PANEL

Aluminium composite panel (**ACP**) also **aluminium composite material**, (**ACM**) is a type of flat panel that consists of two thin aluminium sheets bonded to a nonaluminum core.

ACPs are frequently used for external cladding or facades of buildings, insulation.

ACPs are produced in a wide range of metallic and non-metallic colours as well as patterns that imitate other materials, such as wood or marble.

USES

Applications

ACP is mainly used for external and internal architectural cladding or partitions, false ceilings, signage, machine coverings, container construction etc.

Applications of ACP are not limited to external building cladding, but can also be used in any form of cladding such as partitions, false ceilings etc.

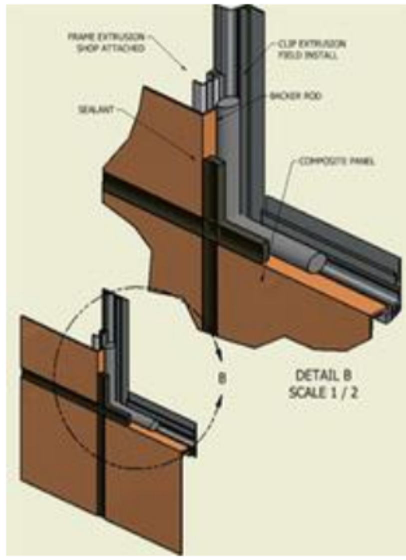


Fig.Aluminium Composite panel

ACP is also widely used within the signage industry as an alternative to heavier, more expensive substrates.

Epcot's Spaceship Earth is an example of the use of ACP in architecture.

ACP has been used as a light-weight but very sturdy material in construction, particularly for transient structures like trade show booths and similar temporary elements.

ACP material has been used in famous structures as Spaceship Earth, VanDusen Botanical Garden, and the Leipzig branch of the German National Library.

MECHANICAL TREATMENT

Mechanical treatment of steel

Purpose – to give desired shape to the ingots so as to make steel available in market forms.

Treatment may be hot working (very common) or cold working

Operation involved in the mechanical treatment of steel

- Drawing
- Forging
- Pressing
- Rolling

Drawing:

This operation carried out

→ to reduce the cross – section

→ to increase the length proportionately.

In this operation the metal is drawn through dies or specially shaped tools. The drawing is continued till wire of required diameter or cross- section is obtained

Process is used to prepare wires and rods

Forging:

- Operation carried out by repeated blows under a power hammer or a press.
- The metal is heated above the critical temperature range.
- It is then placed on anvil and subjected to blows of a hammer.
- This process increase the density and improves grain size of metal.
- The riveting belongs to forging the density and improves grain size of metal.
- The riveting belongs to forging operations.

Process is used for the manufacture of bolts, cramps, etc.

Pressing:

This is slow process and it is carried out in equipment known as the press.

Main advantage – does not involve any shock.

Useful – when a large number of similar engineering articles are to be produced.

- A press consists mainly of a die and a punch.
- The metal is thus pressed between die and punch and article of desired shape is obtained.
- For preparing articles with wide changes of shape, the pressing is to be carried out in different stages.

Rolling :

- This operation is carried out in specially prepared rolling mills.
- The ingots, while still red hot, are passed in succession through different rollers until articles of desired shape are obtained.
- The various shapes such as angles, channels, flats, joists, rails, etc. are obtained by the process of rolling.
- It is possible to prepare joint less pipe with the help of this process.
- The solid rod is bored by rollers in stages until the pipe of required diameter and thickness is obtained

GLASS

- Amorphous substance having homogeneous texture.
- Hard, brittle, transparent or translucent material.
- Common material glazed into frames for doors, windows and curtain walls.
- Common types used in building construction are sheet, plate, laminated, insulating, tempered, wired and patterned glass.
- Most ordinary colourless glasses are alkali-lime silicate and alkali-lead silicate with tensile and compressive strengths of about 30–60 N/mm2 and 700–1000N/mm2, respectively and modulus of elasticity in the range 0.45 × 105 to 0.8 × 105 N/mm2.
- The strength is very much afftected by internal defects, cords and foreign intrusions.
- The main shortcoming of glass is its brittleness which depends on a number of factors, the chief one being the ratio of the modulus of elasticity of the material to its tensile strength.

Constituents

The raw materials used in manufacturing glass are sand, lime (chalks) and soda or potash which is fused over 1000° C. Oxides of iron, lead and borax are added to modify hardness, brilliance and colour.

Functions of the various ingredients are as follows.

Silica is used in the form of pure quartz, crushed sandstone and pulverised flint; should be free from iron contents for best quality glass.

Since it melts at very high temperatures (1710° C) carbonates of sodium or potassium are added to lower down the fusing temperature to about 800° C.

These also make liquid silica more viscous and workable.

Lime is used in the form of limestone, chalk or pure marble and sometimes marl.

The addition of lime makes the glass fluid and suitable for blowing, drawing, rolling, pressing or spinning.

It also imparts durability and toughness to glass.

Excess of lime makes the molten mass too thin for fabrication. Soda acts as an accelerator for the fusion of glass and an excess of it is harmful.

Potash renders glass infusible and makes glass fire resistant.

Lead Oxide imparts colour, brightness and shine.

When 15–30% of it added to substitute lime it lowers the melting point, imparts good workability, while its transparency is lost with the glass becoming brittle and crystalline.

Cullets are broken glasses added to act as a flux to prevent loss of alkali by volatisation during the process of forming glass and also to lower the fusion temperature. However, flux may reduce the resistance of glass to chemical attack, render it water- soluble or make it subject to partial or complete devitrification (crystallisation) on cooling. These crystalline areas are extremely weak and brittle. Stabilizers are added to overcome these defects.
Titanic acid, oxides of Nickel and Cobalt are used for chromatic neutralisation.

Note: Iron is not desirable as a constituent. However, when present it imparts a bottle green colour to the glass. To overcome this manganese dioxide known as glass maker‘s soap is added which washes the liquid glass and removes the colour.

CLASSIFICATION

Depending upon the constituents glasses

- Soda-lime glass,
- Lead glass
- Boro-silicate glass

Commercial Forms

- Sheet Glass
- Plate Glass
- Tempered Glass
- Wired Glass
- Obscured Glass
- Laminated Glass
- Heat absorbing Glass
- Ground Glass
- Block Glass
- Coloured Glass
- Opal Glass
- Optical Glass
- Enamel Glass

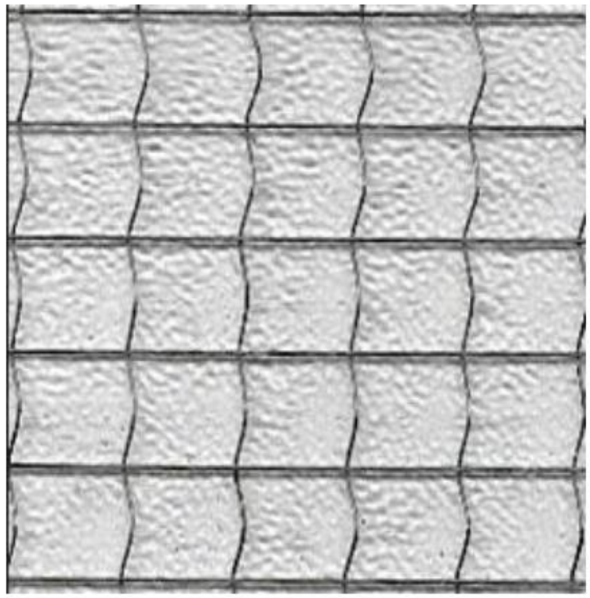


Fig. Wired glass

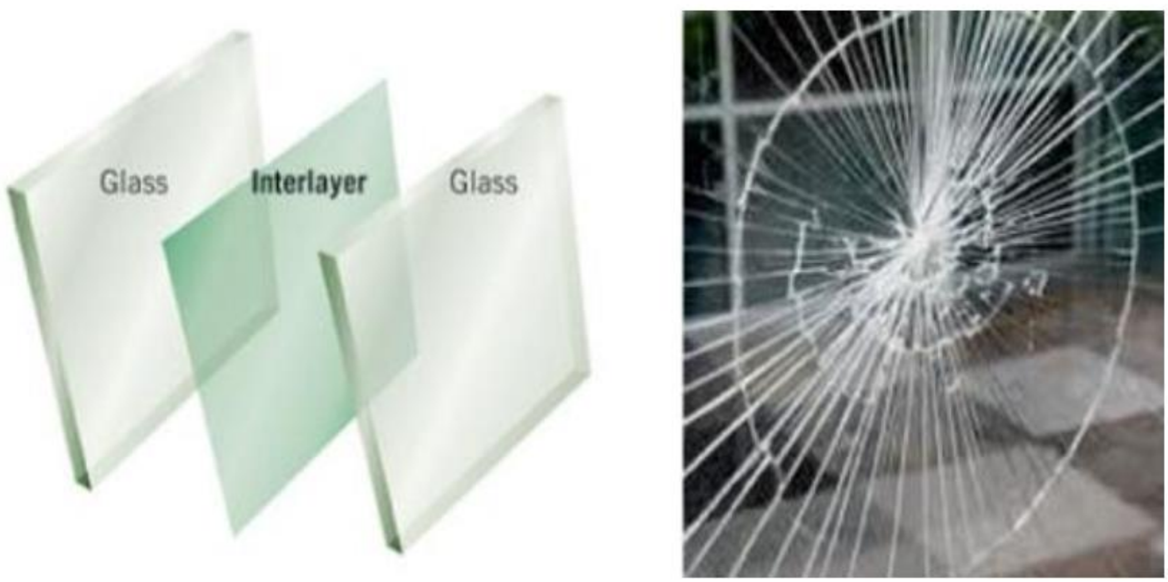


Fig. Laminated glass

Fig. Enamel glass

Depending upon the constituents glasses

Soda-lime Glass (soda-ash glass, soda glass or soft glass)

- Soda-lime glass is obtained by fusing a mixture of silica, lime and soda.
- The quality of this glass can be improved by adding alumina and magnesium oxide and the glass is then called crown glass.
- This is the most common type of glass used in doors, windows and for making glass-wares such as bottles.

Lead Glass (flint glass)

- Obtained by fusing a mixture of silica, lead and potash.
- It is free from iron impurities and is colourless.
- Lead glass has high shining appearance and can take polish.
- It is not affected by temperature.
- Electric bulbs, optical glasses, cut glass, ornamental glass works and radio valves are some of the articles made from it.

Boro-silicate Glass

- Obtained by fusing a mixture of silica, borax, lime and felspar.
- The examples are pyrex glass and heat resisting glass.
- Boro-silicate glass can withstand high temperatures and is most suitable for making laboratory equipments and cooking utensils.

Commercial Forms

Sheet Glass - used for glazing doors, windows and partitions and is obtained by blowing the molten glass into the shape of a cylinder. The ends of the cylinder so produced are cut away and the cylinder is flattened over a plane tray. It is available in thicknesses of 2, 2.5, 3, 4, 5, 5.5 and 6.5 mm and up to 1750 × 1100 mm size and is classified as

Type	Uses
Ordinary glazing quality	General engineering purpose
Selected glazing quality	Class works
Special selected quality	Superior quality works such as show cases and cabinets etc.

Plate Glass - used for all engineering purposes and is superior to sheet glass. A plate glass differs from a sheet glass in that it has a parallel, distortion-free surface obtained by grinding or floating process. It is produced by pouring the molten glass on casting tables and levelling it to an uniform thickness. Both the glass surfaces are then ground, smoothened and polished. Glass so produced is clear and contains unblemished true plane surfaces and is available in thicknesses of 3 to 32 mm and sizes up to 2750 × 900 mm. It is classified as

Type	Uses
Ground glass quality	Showcases, cabinets, counters, shop fronts, etc.
Selected glazing quality	Making mirrors
Special selected quality	High class works, wind screen of vehicles

Tempered Glass is made from plate glass by reheating and sudden cooling and is 3 to 5 times stronger than plate glass. Although not unbreakable, it resists bending stress better than plate glass and, when broken, the pieces are relatively small in size. It is used extensively in sports arenas, sliding doors and curtain walls.

Wired Glass is produced by embedding wire nets 0.46 to 0.56 mm into the centre of sheet glass during casting. The minimum thickness of wired glass is 6 mm. When broken it does not fall into pieces. It has higher melting point than ordinary glass. Wired glass is used for fire resisting doors and windows, for sky lights and roofs. A special example of this is wired- refrax glass which transmits 100 per cent more light than the other glasses.

Obscured Glass is made comparatively opaque to sunlight and also known as patterned glass. They are classified as frosted, rolled and ribbed.

Frosted glass is produced by subjecting the polished face of the glass to a sand blast which grinds off the surface. It can also be produced by etching on glass by hydrofluoric acid.

Rolled glass has a series of waves of desired pattern on the surface and is also known as figured rolled glass.

Ribbed glass A series of triangular ribs are produced in the glass during casting.

Laminated Glass is made by sandwiching a layer of polyvinyl butyral between two or more layers of plate or sheet glass. It is also lso known as safety glass. The examples are heat proof glass, sound proof glass and bullet proof glass. Heat and sound proof glasses two or more glass plates are sandwiched by a tinted plastic inner layer. It provides high resistance to heat and glare. By increasing the thickness of plastic layer the glass can be made more sound resistant.

Bullet proof glass is produced by placing vinyl plastic and glass in several alternate layers and pressing them with outer layers of glass. It is used in banks, jewellery stores and display windows. Insulating glass is composed of two glass plates into which a layer of 6–13 mm thick dehydrated air is sealed. The round edges are formed by fusing together the two glass plates. These glasses reduce the heat transmission by 30–60 per cent.

Heat absorbing Glass is bluish green in colour and cuts ultra violet rays of sun. The example is calorex. It is used in railway carriages, factories, hospitals, health clubs and kitchens.
Ground Glass - In this type of glass one face of plate or sheet glass is made rough by

grinding. It is used for maintaining privacy by obstructing vision and at the same time allowing light. The ground glass is used for bedrooms, toilets and for making black boards.

Block Glass - is hollow sealed made by fastening together two halves of pressed glass? It is

used for making partitions.

Coloured Glass - produced by adding oxides of metals to molten glass:

Opal Glass is also known as milk glass. It is produced by adding bone ash, oxide of tin and white arsenic to vitreosil (99.5% silica glass known as clear silica glass). The composition is 10 parts of sand, 4 parts cryolite and 1 part zinc oxide.

Enamel Glass is produced by adding calcined lead and tin oxide to the ordinary glass. The composition is 10 parts sand, 20 per cent lead and tin oxide and 8 parts potash.

Optical Glass contains phosphorus, lead silicate and a little cerium oxide, the latter capable of absorbing ultraviolet light injurious to eyes. They are used for making lenses.

CERAMICS

A ceramic is an inorganic, nonmetallic solid prepared by the action of heat and subsequent cooling.

Ceramic materials may have a crystalline or partly crystalline structure, or may be amorphous (e.g., a glass).

Because most common ceramics are crystalline, the definition of ceramic is often restricted to inorganic crystalline materials, as opposed to the non crystalline glasses, a distinction followed here.

Earliest ceramics made by humans were pottery objects, including 27,000 year old figurines, made from clay, either by itself or mixed with other materials, hardened in fire.

Later ceramics were glazed and fired to create a colored, smooth surface.

Ceramics now include domestic, industrial and building products and a wide range of ceramic art.

In the 20th century, new ceramic materials were developed for use in advanced ceramic engineering; for example, in semiconductors.

Fig. Ceramic Tiles

SEALANTS FOR JOINTS

The development of construction technique has posed the problem of providing durable sealants in the joints between different engineering materials such as aluminium, concrete, glass, marble, masonry wall, steel and stone.

The spacing of joints should be kept in such a way that the stresses developed due to the movement of building materials are properly regulated and maintained within permissible limits.

A sealant material in a joint has to face the following conditions:

- It changes shape with the change in the width of the joint.
- It is always in shear in lap joints
- It is always in tension

Following are the properties of a good sealant so as to fulfill its provision in a joint:

- Should have good bond
- Should not deteriorate either due to weather effects (or) due to stress and stress relief cycles.
- Should remain flexible and soft.

It is found that the sealants possessing above properties are classified as elastometric sealants and these sealants are silicone based, urethane based, acrylic based and polysulphide based sealants.

Out of all these, the polysulphide based sealants have become more popular because of their superior performance.

FIBRE GLASS REINFORCED PLASTIC (FRP)

Description:
FRP is a composite material made of a polymer matrix reinforced with fibers.
The polymer is usually an epoxy, vinylester or polyesterthermosetting plastic.
FRP is commonly used in the aerospace, automotive, marine, and construction industries.
Application: FRP is manufactured and tested to perform in locations such as: commercial

kitchens, public restrooms, hospitals, schools, correctional facilities, restaurants, car washes, meat and dairy facilities, coolers and freezers, supermarkets, clean rooms and laboratories.

Fig. FRP Products

CLAY PRODUCTS

Clay products are one of the most important classes of structural materials.

The raw materials used in their manufacture are:

- clay blended with quartz sand, chamatte (refractory clay burned at 1000–1400°C and crushed), slag, sawdust pulverized coal.
-

Bulk specific gravity of clay brick ranges from 1.6 to 2.5.

According to the method of manufacture and structure, bricks, tiles, pipes, terracotta, earthenware‘s, stoneware‘s, porcelain, and majolica are well recognized and employed in building construction.

Clay bricks have pleasing appearance, strength and durability whereas clay tiles used for light-weight partition walls and floors possess high strength and resistance to fire.

Clay pipes on account of their durability, strength, lightness and cheapness are successfully used in sewers, drains and conduits

REFRACTORY'S (Fire-Clay Or Refractory Clay)

Fire-clay is a term, loosely applied, to include those sedimentary or residual clays which vitrify at a very high temperature and which, when so burnt, possess great resistance to heat.

These are pure hydrated silicates of alumina and contain a large proportion of silica 55–75%, alumina 20–35%, iron oxide 2–5% with about 1 per cent of lime, magnesia and alkalis.

Fire clays are capable of resisting very high temperatures up to 1700°C without melting or softening and resist spalling.

The presence of a small percentage of lime and magnesia and alkalis help to melt the clay particles more firmly, whereas a large percentage of lime and magnesia tend to melt the clay at low temperatures.

Fig. High dense fire clay bricks

Iron oxide or other alkalis reduce refractory qualities of fire clay. The fire clay is used for manufacturing fire bricks used in furnaces linings, hollow tiles, and crucibles.

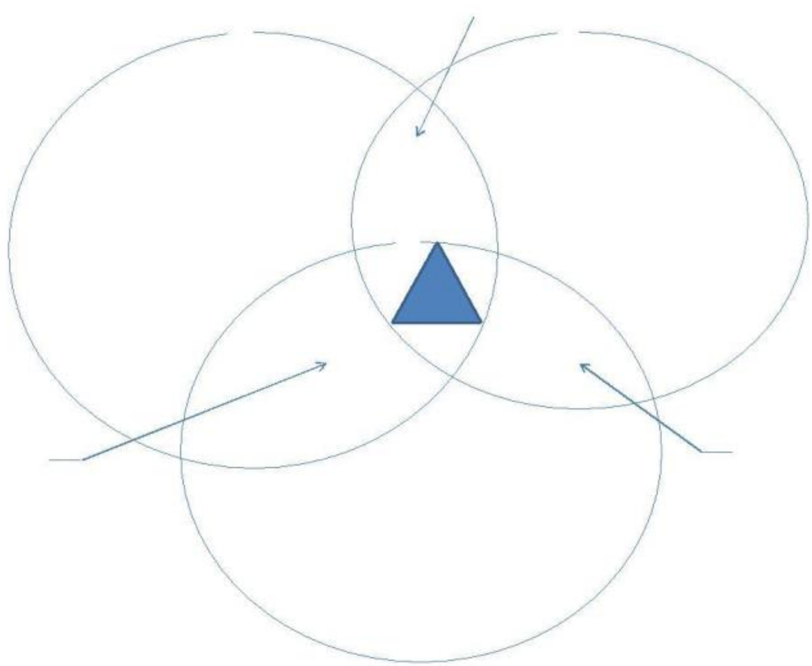
COMPOSITE MATERIALS

Composite materials are materials made from two or more constituent materials with significantly different physical or chemical properties.
The individual components remain separate and distinct within the finished structure.

Metal-filled plastics

Plastics (resins, thermoplastics, rubbers, foams, textile, fibres, etc.

Metals and alloys (steels, aluminium, alloys, copper and brasses, titanium, etc.



Fiber – reinforced plastics (GRP, FRP, GFRP, CFRP glass coated fabrics, etc.)	Ceramics and glasses (glass, fired ceramics, concrete, etc.	Metal matrix composites, ceramic matrix composites (including ordinary reinforced concrete and steel-fibre reinforced concrete)

Evolution of composites form different classes of engineering materials

Typical engineered composite materials include:

- Composite building materials such as cements, concrete
- Reinforced plastics such as fiber-reinforced polymer
- Metal Composites

- Ceramic Composites (composite ceramic and metal matrices) Composite materials are generally used for buildings,

- bridges
- Structures such as:
  - boat hulls
  - swimming pool panels
  - race car bodies
  - shower stalls
  - bathtubs
  - storage tanks
  - imitation granite
  - cultured marble sinks
  - counter tops.

The most advanced examples perform routinely on spacecraft in demanding environments.

TYPES of Composites

Composite materials - usually classified by the type of reinforcement they use.
This reinforcement is embedded into a matrix that holds it together.
The reinforcement is used to strengthen the composite.

For example, in a mud brick, the matrix is the mud and the reinforcement is the straw.

Common composite types include:

- Random-fiber or short-fiber reinforcement,
- Continuous-fiber or long-fiber reinforcement,
- Particulate reinforcement,
- Flake reinforcement, Filler reinforcement.

Fiber:

It is defined as one of the delicate, hair portions of the tissues of a plant or animal or other substances that are very small in diameter in relation to there length. A fiber is a material which is several hundred times as long as its thick.

Textile Fiber:

Textile fiber has some characteristics which differ between fiber to **Textile fiber**. Textile fiber can be spun into a yarn or made into a fabric by various methods including weaving, knitting, braiding, felting, and twisting. The essential requirements for fibers to be spun into yarn include a length of at least 5 millimeters, flexibility, cohesiveness, and sufficient strength. Other important properties include elasticity, fineness, uniformity, durability, and luster.

Banana fiber is one kind of fiber but it is not a textile fiber. Because it can not fill up the above properties. So we can say that all fiber are not textile fiber.

Types of Textile Fiber:

Generally two types of fiber.

1. Natural fiber.
2. Manmade fiber.

Natural Fiber:

Natural fibers include those produced by plants, animals, and geological processes. They are biodegradable over time. They can be classified according to their origin.

A class name for various genera of fibers (including filaments) of:

(1) animal (i.e., **silk fiber** and **wool fiber**);

(2) mineral (i.e., **asbestos fiber**); or

(3) vegetable origin (i.e., **cotton fiber**, **flax fiber**, **jute fiber**, and ramie fiber).

Manmade Fiber:

It is also known as Manufactured fiber. Synthetic or man-made fibers generally come from synthetic materials such as petrochemicals. But some types of synthetic fibers are manufactured from natural cellulose; including rayon, modal, and the more recently developed Lyocell. A class name for various genera of fibers (including filaments) produced from fiber-forming substances which may be:

(1) Polymers synthesized from chemical compounds, e.g., **acrylic fiber**, **nylon fiber**, **polyester fiber**, polyethylene fiber, polyurethane fiber, and polyvinyl fibers;

(2) Modified or transformed natural polymers, e.g., alginic and cellulose-based fibers such as **acetates fiber** and rayons fiber; and

(3) Minerals, e.g., glasses. The term manufactured usually refers to all chemically produced fibers to distinguish them from the truly natural fibers such as cotton, wool, silk, flax, etc.e.g: **Glass fiber**,

GEO-MEMBRANES AND GEO-TEXTILES FOR EARTH REINFORCEMENT.

The Primary purpose of reinforcing a soil mass is to improve its stability, increasing its bearing capacity and reduce Settlements and Lateral deformations.

Reinforcing materials: stainless steel, aluminum, and fiberglass to nylon, polyster, polyamides, and other synthetics in the form of strips. Geosynthetics, geotextiles, geogrids and geocomposits.

Geosynthetic reinforced soil (GRS) retaining walls have been used successfully as earth retaining structures for more than four decades (Allen et al., 2002). The main reasons for their popularity are reduced cost, ease of construction and better performance compared to conventional unreinforced soil wall alternatives. Average cost savings of 50% over traditional concrete cantilever walls have been reported in the USA (Koerner et al., 1998) and in the UK (Jones, 1994). A corollary benefit of this technology is a reduction in environmental cost. Jones (1994) estimated that 40% less SO2 is released to the atmosphere during fabrication of the component parts using GRS walls compared to traditional cantilever wall structures. A major cost component for GRS walls is the soil used in the reinforced zone when it must be transported to site (typical case). Most often this material is a select material that must meet speci- fications regarding particle size distribution, strength and permeability. The availability of naturally occurring deposits of acceptable granular soil materials at reasonable distances from a project site can be prohibitive. A strategy to reduce this cost is to employ recycled construction and demolition waste (RCDW) as the backfill material in geosynthetic reinforced soil walls (Santos et al., 2012a,b). Part of the cost benefit is the savings that accrue from avoiding the tipping charges required to dispose of the RCDW in a landfill. As an example, approximately 70% of the waste disposed in landfills in the city of Brasilia, Brazil, comes from construction and demolition works (Santos, 2011). This figure is not much different in several other cities in the country. A description of typical construction demolition waste in Brazil is reported by Santos et al. (2010b).

Fig. Plaster of Paris

Fig. Gypsum board false ceiling

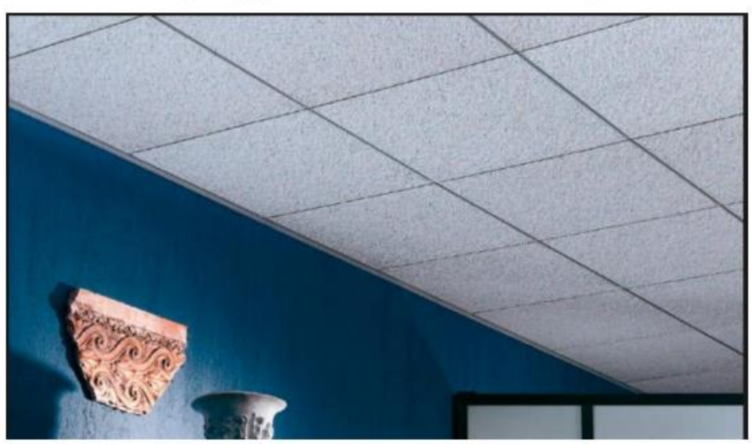


Fig. Mineral Fiber false ceiling

Fig. Metal Ceiling

Fig. Polyester fiber textile