| **Material** | **properties** | **uses** |
| --- | --- | --- |
| **Timber;Timber** is a type of wood which has been processed into beams and planks. It is also known as “lumber” in US and Canada. Basically, timber or Lumber is a wood or firewood of growing trees. Any wood capable of yielding a minimum dimensional size can be termed as a timber or lumber.  | **Colour**Color is a uniform property by which most trees are characterized as they show variation from tree to tree. Light color indicates weak timber. **Appearance**Smell is a good property as timbers for few plants as they can be identified by their characteristic aroma. Fresh cut timbers have a good smell.**Hardness**For the resistance of any kind of damage, hardness is an obvious property.**Specific Gravity**Variation of timber in specific gravity (0.3-0.9) is found. It depends on pores present inside timber. The specific gravity of this light material is less than that of water (<1). But in case of compact wood where pores are almost absent and become heavier, their specific gravity increases up to 1.5.Other properties are;* Moisture Content,Grain,Shrinkage and Swelling,Strength,Density,Toughness,Elasticity,Warping,Durability,Defectless ,Workability ,Soundness ,Free of abrasion
 | * As a Fuel Source
* Construction Materials
* Furniture
* Timber Beams
* Paper and Pulp
* Other Uses

Timber also finds use in the creation of textile products such as rayon. The oils and other extracts from timber are used in the creation of products including paints, resins, and gum. Timber of lower grades is also used for the creation of wooden boxes and csrate for shipping and storage. |
| STEEL; **Steel** is an alloy of iron with typically a few percent of carbon to improve its strength and fractureresistance compared to iron. | * Ductility

Ductility is a measure of the degree to which a material can strain or elongate between the onset of yield and eventual fracture under tensile loading as demonstrated in the figure below.* Weldability

All structural steels are essentially weldable. However,welding involves locally melting the steel, which subsequently cools. The cooling can be quite fast because the surrounding material, e.g. the beam, offers a large 'heat sink' and the weld (and the heat introduced) is usually relatively small. * Yield strength

Yield strength is the most common property that the designer will need as it is the basis used for most of the rules given in design codes.* Toughness

It is in the nature of all materials to contain some imperfections. In steel these imperfections take the form of very small cracks. If the steel is insufficiently tough, the 'crack' can propagate rapidly, without plastic deformation and result in a 'brittle fracture'. |  |
| ASPHALT;**Asphalt** is a sticky, black, semi-solid form of petroleum used to bind aggregate together. | * Stability;Stability of an asphalt pavement is its ability to resist shoving and rutting under loads (traffic).
* Durability;The durability of an asphalt pavement is its ability to resist factors such as changes in the binder (polymerization and oxidation), disintegration of the aggregate, and stripping of the binder films from the aggregate.
* Flexibility ;Flexibility is the ability of an asphalt pavement to adjust to gradual settlements and movements in the sub-grade without cracking.
* Fatigue Resistance; Fatigue resistance is the pavement’s resistance to repeated bending under wheel loads.
* Skid Resistance; Skid resistance is the ability of an asphalt surface to minimize skidding or slipping of vehicle tires, particularly when wet.
* Impermeability; Impermeability is the resistance of an asphalt pavement to the passage of air and water into or through it.
* Workability; Workability describes the ease with which a paving mixture can be placed and compacted.
 | Many architects use asphalt in construction for dams, reservoirs, playgrounds and parks. Farmers use asphalt to line the bottom of retention ponds where they raise fish and in livestock containment pens. Asphalt is also an ideal solution for flood control and soil erosion. Auto makers rely on asphalt to prevent rust and road noise in fenders and hoods of cars. |
| CEMENT; Is one of the most important building materials, is a binding agent that sets and hardens to adhere to building units such as stones, bricks, tiles, etc. Cement generally refers to a very fine powdery substance chiefly made up of limestone (calcium), sand or clay (silicon), bauxite (aluminum) and iron ore, and may include shells, chalk, marl, shale, clay, blast furnace slag, slate. | Fineness of CementThe size of the particles of the cement is its fineness. The required fineness of good cement is achieved through grinding the clinker in the last step of cement production process. As hydration rate of cement is directly related to the cement particle size, fineness of cement is very important.Soundness of CementSoundness refers to the ability of cement to not shrink upon hardening. Good quality cement retains its volume after setting without delayed expansion, which is caused by excessive free lime and magnesia.Strength of CementThree types of strength of cement are measured compressive, tensile and flexural. Various factors affect the strength, such as water-cement ratio, cement-fine aggregate ratio, curing conditions, size and shape of a specimen, the manner of molding and mixing, loading conditions and age.Setting Time of CementCement sets and hardens when water is added. This setting time can vary depending on multiple factors, such as fineness of cement, cement-water ratio, chemical content, and admixtures. Cement used in construction should have an initial setting time that is not too low and a final setting time not too high.HydrationWhen water is added to cement, the reaction that takes place is called hydration. Hydration generates heat, which can affect the quality of the cement and also be beneficial in maintaining curing temperature during cold weather. On the other hand, when heat generation is high, especially in large structures, it may cause undesired stress. | 1. It is used in mortar for plastering, masonry work, pointing, etc.
2. It is used for making joints for drains and pipes.
3. It is used for water tightness of structure.
4. It is used in concrete for laying floors, roofs and constructing lintels, beams, stairs, pillars etc.
5. It is used where a hard surface is required for the protection of exposed surfaces of structures against the destructive agents of the weather and certain organic or inorganic chemicals.
6. It is used for precast pipes manufacturing, piles, fencing posts etc.
7. It is used in the construction of important engineering structures such as bridges, culverts, dams, tunnels, lighthouses etc.
8. It is used in the preparation of foundations, watertight floors, footpaths etc.
9. It is employed for the construction of wells, water tanks, tennis courts, lamp posts, telephone cabins, roads etc.
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| POLYMERS; Is any of a class of natural or synthetic substances composed of very large molecules, called macromolecules, that are multiples of simpler chemical units called monomers. | ***Heat capacity/ Heat conductivity*** -- The extent to which the plastic or polymer acts as an effective insulator against the flow of heat.***Thermal expansion*** --The extent to which the polymer expands or contracts when heated or cooled.***Crystallinity*** -- The extent to which the polymer chains are arranged in a regular structure instead of a random fashion.***Permeability*** -- The tendency of a polymer to pass extraneous materials.***Elastic modulus*** -- The force it takes to stretch the plastic in one direction.***Tensile strength*** -- The strength of the plastic. ***Resilience***--The ability of the plastic to resist abrasion and wear.***Refractive index***-- The extent to which the plastic affects light as it passes through the polymer.***Resistance to electric current***-- Is the material an insulator, like most polymers, or does it conduct an electric current?  | * Polypropene finds usage in a broad range of industries such as textiles, packaging, stationery, plastics, aircraft, construction, rope, toys, etc.
* Polystyrene is one of the most common plastic, actively used in the packaging industry. Bottles, toys, containers, trays, disposable glasses and plates, tv cabinets and lids are some of the daily-used products made up of polystyrene. It is also used as an insulator.
* The most important use of polyvinyl chloride is the manufacture of sewage pipes. It is also used as an insulator in the electric cables.
* Polyvinyl chloride is used in clothing and furniture and has recently become popular for the construction of doors and windows as well. It is also used in vinyl flooring.
* Urea-formaldehyde resins are used for making adhesives, moulds, laminated sheets, unbreakable containers, etc.
* Glyptal is used for making paints, coatings, and lacquers.
* Bakelite is used for making electrical switches, kitchen products, toys, jewellery, firearms, insulators, computer discs, etc.
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| WOOD; Wood is a porous and fibrous structural tissue found in the stems and roots of trees and other woody plants. It is an organic material – a natural composite of cellulose fibers that are strong in tension and embedded in a matrix of lignin that resists compression. | 1. Color and Odor.Most trees are characterized by a typical color and odor.Thus, walnut wood is distinguished by its typical dark brown color.Similarly, a freshly cut teak wood has a golden yellow shade.2. HygroscopicityWood can absorb water as a liquid, if in contact with it, or as vapour from the surrounding atmosphere. Although wood can absorb other liquids and gases, water is the most important. 3. Shrinkage and swellingWood undergoes dimensional changes when its moisture fluctuates below the fibre saturation point. Loss of moisture results in shrinkage, and gain in swelling.  | 1. Construction and Fencing* **Home Construction**:

During the early periods, use of wood in domestic construction was a common scene and this is still followed in this twenty-first century. In different parts of the world in the making of houses, wood is used commonly like the flooring, frames of doors and windows for its strength and internment quality.* **Fencing and Decorating Gardens**:

In modern decoration system woods are also used for building the fencing and simple decoration for artificial gardening inside a home or on roofs.2. Household Uses* **Utensils**:

Utensils made up of wood instead of plastic and steel are a symbol of elegance which increases the charm and loveliness of the home corners.* **Hand Tools**:

The handles of most common hand tools made of wood help as heat resistant when they are kitchenware used in an oven and closes the chance to shock while used on electricity.3. Art Industry* **Artworks**:

For artworks such as statues, sculptures, carvings and making decorative objects woods are widely used. The frames of art board, color plate are also made from wood in many cases.* **Musical instrument**:

The musical instruments such as Piano, violin, cello, drums, flute, guitar, double bass and a number of other music instruments material requires wood for making a perfect tune.4. Sports Equipment* **Wooden Toys**:

These are preferred to plastic towards the health conscious people which were supposed as a fashion before. Plastic is nothing but the combination of chemicals which is hazardous to children's health. Cricket, hockey, billiard, table tennis etc. Toys and sports equipment have long made use of wood for handles and main parts.5. Commercial Uses* **Furniture**:

At present, the market for wooden furniture is very profitable. No one can deny the demand for wooden furniture as it is a sign of aristocracy since ancient time.* **Shipbuilding**:

Ships and rural fishing boats were made from wood. For constructing boats and ships wood is one of the most important construction material. Hardwood and softwood were used in the past for ship industry. * **Fuel**:

Wood is an age-old source of energy all over the world. Before the exploration of gas, fuel was the main source we can also define as only one source of energy that people used by burning as woods were available in the forest easily. Generally, sticks, pellets, sawdust, and charcoal are used as an energy source from wood. Usually, woods from cheap plants are used in this sector.  * **Stationary**:

Some stationaries like paper pencil are made of wood. Wood pulp is used for making paper. Wood is used for making pencils too. |
| BITUMEN; Bitumen also known as asphalt in the United States, is a substance produced through the distillation of crude oil that is known for its waterproofing and adhesive properties.Bitumen production through distillation removes lighter crude oil components, such as gasoline and diesel, leaving the “heavier” bitumen behind. | 1. Adhesion
2. Resistance to Water
3. Hardness
4. Viscosity and Flow
5. Softening Point
6. Ductility
7. Specific Gravity
8. Durability
9. Versatility
10. Economical
11. Strength
 |  Most refined **bitumen** is used in the construction industry. Mainly, it serves its **use** in paving and roofing **applications**. 85% of all **bitumen** is used as a binder in asphalt for roads, runways, parking lots, and foot paths. |
| METAL; is a material that, when freshly prepared, polished, or fractured, shows a lustrous appearance, and conducts electricity and heat relatively well.  | * high melting point
* good conductors of electricity
* good conductors of heat
* high density
* malleable.
* ductility
 | 1) Gold, Platinum and silver are used as jewelleries and ornaments.2) Iron and steel are used for construction purpose.3) Aluminium, steel are used as utensils.4) Mercury is used in thermometer and helps to check the temperature.5) Aluminium are used as insulation wires.6) Aluminium foils are used as food wrappers.7) Silver foil is used in sweets.8) Zinc is used for galvanising to prevent rusting.9) Iron is used in automobiles.10) Copper is used for making cable wires. |
| GLASS | * Hardness and Brittleness. It is a hard material as it has great impact resistance against applied load.
* Weather resistance
* Insulation.
* Chemical resistance
* Colour and Shape Varieties.
* Transparency.
* Fire Resistant Glazing.
* Property Modification.
 | * Windows and doors.
* Facades.
* Reinforcement structures.
* Tableware (plate, cups, bowls)
* Insulation
* Conservatory.
* Jar packaging for food.
* Bottles for drinks
 |
| CERAMICS; A ceramic is any of the various hard, brittle, heat-resistant and corrosion-resistant materials made by shaping and then firing a nonmetallic mineral, such as clay, at a high temperature. | * High melting point (so they're heat resistant).
* Great hardness and strength.
* Considerable durability (they're long-lasting and hard-wearing).
* Low electrical and thermal conductivity (they're good insulators).
* Chemical inertness(they're unreactive with other chemicals).
 | * Tiles. Our roofs, bathrooms and kitchens are covered in ceramic tiles
* Cookware. Majority of crockery and pots are made from ceramics.
* Brick. Our homes are made from brick and are held together by cement.
* Toilets
* Space
* Cars
* Artificial Bones and Teeth
* Electronic Devices.
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