- Easy to work upon.
- Light in weight and a few varieties are glossy like glass.
- Not attacked by insects and fungi.
- Available in desired color and texture.
- Require a little maintenance.
- Good electrical insulators and have low thermal conductivity.
- Shock absorbing material.
- Can be sawn, drilled and punched and welded easily.
- High strength to weight ratio.
- High resistance to weathering conditions.
- Corrosion resistant.
- Painting or polishing of the surface is not required.
- Some varieties are as hard as steel.
- Withstands moisture, oil and grease well.
- High coefficient of thermal expansion (about ten times of steel).
- Deterioration under prolonged exposure to sun's ultra violet rays.
- Low manufacturing cost, hence cheap.

BITUMEN

Bitumen is a non-crystalline solid or viscous material derived from petroleum, by natural or refinery process and substantially soluble in carbon disulphide. It is asphalt in solid state and mineral tar in semi fluid state. Bitumen is brown or black in color. Its main constituents are petrolene (a yellowish oily substance, an excess of which makes bitumen to melt at low temperature) and asphaltene (hard black substance, an excess of which makes bitumen brittle and non-plastic). It contains carbon 87 %, hydrogen 11 % and oxygen 2 %.

Bitumen is not affected by light, air or water individually, but in combination they can make it brittle, porous and susceptible to oxidation forming blisters and cracks. It becomes soft at temperatures between 30°–100° C (no sharp melting point), and therefore must be protected from exposure to heat. It is insoluble in water and fairly resistant to most acids. Although bitumen is combustible, composite products, such as mastic asphalt, are not readily ignited.

Classification

based on source: Bitumens are classed as natural and petroleum bitumens.

natural bitumen: Pure natural bitumen occurs rarely. Limestones, sandstones and soils impregnated with bitumen are frequently found. It originates from the accumulation of petroleum in the top layers of earth crust through migration, filling pores and cavities of rocks, under the action of high temperature and pressure.

petroleum bitumen: are product of processing crude petroleum and its resinous residues. One of the petroleum bitumen types is oxidized bitumen which is produced by blowing air through petroleum residues. Oxygen from air combines with hydrogen of the residues to give water vapor. The petroleum residues thicken because of polymerization and condensation.

Properties

The various properties are viscosity, ductility and softening point.

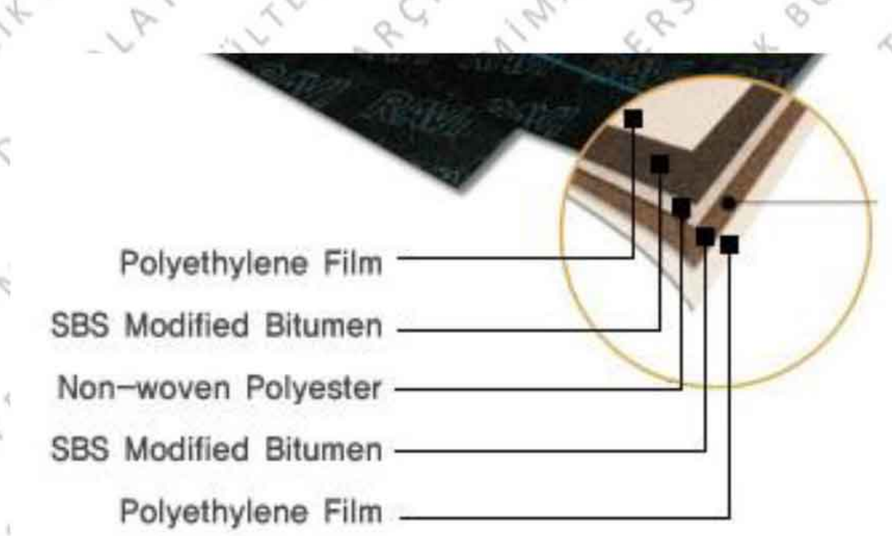
Viscosity depends greatly on temperature. At lower temperature, bitumen has great viscosity and acquires the properties of a solid body, while with increase in temperature the viscosity of bitumen decreases and it passes into liquid state.

Ductility depends upon temperature, group composition and nature of structure. Viscous bitumens, containing solid paraffins at low temperatures are very ductile.

Softening point is related to viscosity. Bitumen needs sufficient fluidity before specific application.

Resilience: Bitumen is resilient, non-rigid and as such it is capable of absorbing shocks and accommodates itself to the movement in structure due to temperature, settlement or shrinkage.

bituminous sheets: These are manufactured by running refined bitumen on to with hessian, fiber or mineral fiber bases into sheets of different thicknesses and qualities. Base works to reinforce the soft bitumen layers to make the sheets more stabile against tensile stress. These sheets are used for damp proof courses. These can be bent without cracking. To increase the performance of the bitumen layers, some chemical interventions can be made to change its properties. Apart from oxidized bitumen, some thermoplastic resins can be mixed to produce polymer bitumen. According to the type of the thermoplastic resin, there are two different polymer modified bitumen sheets: plastomeric (with APP [atactic polypropylene] additives) or elastomeric (with SBS [styrene-butadiene-styrene] additives). Plastomeric polymer modified bitumen sheets can be used in hot climates. Elastomeric polymer modified bitumen sheets can be used in cold climates. Also the surfaces of bitumen sheets can be covered with different materials such as polyethylene films, fine sand, mineral splinter or metal foil.



PAINTS

Paint is a liquid surface coating. On drying it forms a thin film (60–150 μ) on the painted surface. Paints are classified as oil paints, water paints, cement paints, bituminous paints and special paints such as fire proof paints, luminous paints, chlorinated rubber paints (for protecting objects against acid fumes), etc.

The functions of the paints are: to protect the coated surface against possible stresses (mechanical or chemical); deterioration (physical or environmental); decorate the structure by giving smooth and colorful finish; check penetration of water, formation of bacteria and fungus, the corrosion of the metal structures, the decay of wood work and to varnish the surface to display it to better advantage.

Composition of Oil Paints

base: The base, usually a metallic oxide, is the principal constituent of the paint. It makes the paint film opaque and possesses binding properties which reduce the shrinkage cracks in the film on drying. Some of the examples of base are white lead, red lead, zinc white, aluminum powder, iron oxide, etc. Lead based paints are in general affected by atmosphere and are not recommended for final coats. Zinc white is weather resistant. For inferior works Lithophone (barium sulfate chemically combined with zinc sulfide) is used for inside work. Aluminum powder is used as base for all aluminum paints.

zinc white

aluminum powder

vehicle: Also known as binder, vehicle is an oil to which the base is mixed. It holds the constituents of paint in suspension and helps spread it over the surface to be painted, imparts durability, toughness and water proofness to the paint film and resistance to weathering and gloss to the painted surface and forms the body of the paint. The examples are natural drying oils such as linseed oil, nut oil, poppy oil and tung oil.

linseed oil (bezir yağı / keten tohumu)

Pigments are used to hide the surface imperfections and to impart the desired color. They protect the paint film by reflecting the destructive ultra violet light, which acts as a catalytic agent for the destructive oxidation of the film. They also improve the impermeability of the paint film and enhance its resistance to weathering, affect the flow characteristics making it possible to paint vertical and uneven surfaces smoothly. Pigments are finely ground mineral, organic substances or metal powders; their size in organic coatings ranges from 0.1 to 5.0 microns in diameter. Their general properties are covering power, coloring capacity, fineness, fire resistance, chemical stability and weather resistance. The fine particles of the pigments have a reinforcing effect on the paint film.

solvents are the oils used to thin the paints, increase the spread, and are also known as thinners. They make the paint of workable consistency and evaporate during drying of the film. The common thinning agents used are petroleum, spirit, naptha and turpentine oil.

driers: also known as plasticizers, are chemicals added to paint for specific purposes, e.g., as catalyst (accelerate the drying of the vehicle) for the oxidation, Polymerization and condensation of the vehicle in paint. The quantity of drier is limited to 8 per cent, excess of it affects the elasticity of paint leading to flaking failure. Some of the examples of driers are letharge (oxidized lead, PbO), lead acetate, red lead (Pb_3O_4), manganese dioxide and cobalt, zinc and lead chromate. Red lead is the best for primary coat over steel and metal work; it produces an extremely hard and tough film, almost impervious to air and moisture, adheres firmly to the metal and is extremely effective in protecting steel from corrosion. The cost of zinc and lead chromates is high.

Defects

They may arise from a variety of causes but the principal reasons behind them are incorrect choice of paint in relation to backing materials, application of paint to a damp surface or one to which moisture may have access and; poor workmanship.

The factors affecting durability are dampness, cleanliness, movements, chemical reactions, etc. If paint is applied on an insufficiently dry background the moisture is trapped and in the process of subsequent drying the adhesion of the paint breaks down. Paint will not adhere to the surface if it is not cleaned of dirt or dust. The painting processes can be delayed for proper results for movements caused by shrinkage and special paints should be used for thermal movements. Chemical reactions between backing material and paint film may push the paint off the backing material and lead to softening or discolourize the paint. Also the paint film is subjected to chemical attack of atmosphere, sunlight and heat, all deteriorating it.

blistering and peeling are swelling of the paint film and can be defined as localized loss of adhesion between one or more coatings or between primer and parent surface.

checking is caused when the paint film lacks in tensile strength and occurs when paint is applied during very cold weather or because of insufficient drying of undercoat.

chalking: Paint film becomes powder due to insufficient oil in primer.

alligatoring: One layer of paint films sliding over the other one, when a hard paint is applied over a soft one or vice versa.

running and sagging: Paints applied over smooth and glossy surface do not stick and flow back or towards the unpainted area.

mildew thrives in warm, moist and dark places. Zinc oxide and phenol mercury oleate are very useful to check its growth.

VARNISH

Varnish is a nearly homogeneous solution of resin (copal, lac, shellac, rosin, etc.) in solvent (oil, alcohol or turpentine). The type of solvent depends upon the type of resin used. The oil dries with time and the other solvents evaporate leaving behind a solid transparent resin film over the surface. For rapid drying, driers such as letharage, lead accetate, etc. are used.

The objects of varnishing a surface are to:

- Brighten the appearance of the grain in wood.
- Render brilliancy to the painted surface.
- Protect painted surface from atmospheric actions.

Characteristics of an ideal varnish:

- It should render the surface glossy.
- It should dry rapidly and present a finished surface which is uniform in nature and pleasing in appearance.
- The color of varnish should not fade away when the surface is exposed to atmospheric actions.

- The protecting film developed by varnish should be tough, hard and durable.
- It should not shrink or show cracks after drying.

Varnishes are classified as oil, spar, flat, spirit and asphalt varnishes.

oil varnish: uses linseed oil and takes about 24 hours to dry. Hard resins such as amber and copal are dissolved in linseed oil. If the varnish is found unworkable, a small amount of turpentine oil may be added. It is suitable both for interior and external works.

flat varnish: materials such as wax, metallic soap or finely divided silica when added to varnish produce a dull appearance on drying and are known as flat varnish.

spirit varnish: is resins of soft variety such as lac or shellac dissolved in spirit. The examples are French polish, lacquer and shellac varnish. It dries very quickly. These are not durable and are easily affected by weathering action.

LINOLEUM

It is a plastic material obtained by oxidizing linseed oil into a rubber like substance mixed with ground cork, wood flour and pigments. The resulting material is pressed upon a backing of burlap. Linoleum is classified as plain, printed and inlaid. It is available in the form of tiles and rolls. The plain linoleum of a uniform color is available in thickness 2–4.5 mm. The printed linoleum has a pattern printed on it in oil paints. Its thickness ranges from 1.25–2 mm. The inlaid linoleum has small units of linoleum in different colors and shapes patterned and pressed on burlap back. Linoleum is durable, resilient, quiet and comfortable. It is cheap and easy to install and maintain.