

5.3 BITUMEN

Asphalt, bitumen and tar are referred as bituminous materials, which are essentially hydrocarbon materials. The **asphalt** is a mixture of inert mineral matter lime alumina, lime, silica etc. and a hydrocarbon known as asphaltic bitumen. In some places like Trinidad and Bermudez, asphalt is available in nature at a depth of 3 to 60 metres. It is known as **natural asphalt**. Common variety used all over the world is **residual asphalt**, which is obtained by fractional distillation of crude petroleum oil. Bitumen is the binding material which is present in asphalt. It is a hydrocarbon. It is obtained by partial distillation of crude oil. It contains 87 per cent carbon, 11 per cent hydrogen and 2 per cent oxygen.

Tar is obtained in the destructive distillation of coal, wood or other organic materials. When coal or wood is heated to redness in a closed chamber, it yields volatile product and residue coke. After separating and cooling volatile product gives tar.

Comparison between asphalt, bitumen and tar is presented in Table 5.1.

Table 5.1. Comparison between asphalt, bitumen and tar

<i>S. No.</i>	<i>Property</i>	<i>Asphalt</i>	<i>Bitumen</i>	<i>Tar</i>
1.	Colour	Blackish brown	Dark with slight reddish tinge	Deep dark
2.	Carbon content	Low	Moderate	High
3.	State	Solid or semisolid	Solid	Viscous liquid
4.	Effect on heating	Burns with a smoke flame and becomes plastic	Melts	Becomes more fluid.
5.	Setting time	Less	Less	More
6.	Adhesive power	Less	More	Most
7.	Resistance to acid	More	More	Less
8.	Use	As damp proof course, for paints, as roofing felt and for road works.	As damp proof course and as roofing felt.	For preserving timber.

5.4 ASBESTOS

Asbestos is a general name for several varieties of fibrous minerals which are available in nature. But presently, most of the commercial asbestos produced is 'chriotile' $[\text{Mg}_6\text{SiO}_{11}(\text{OH})_6 \cdot \text{H}_2\text{O}]$.

Properties of Asbestos

1. It is flexible, soft and non-porous.
2. It is fire proof and acid proof material.
3. It is a good insulator of heat and electricity.

4. When it is mixed with cement and water, it retains shape firmly.
5. Its colour is brown or grey.
6. It can be cut into pieces or can be drilled.
7. It possesses high tensile strength in the direction of its fibres.
8. Its specific gravity is 3.10.

Uses of Asbestos

1. Asbestos cement sheets are the cheapest roofing materials.
2. Asbestos cement pipes are used as down take pipes of rain water from the roof.
3. With bitumen it forms good damp proof layer.
4. It is used for preparing fire proof ropes and clothes.
5. It is used as covering material for fuse and electric switch boxes.
6. It is useful for insulating boilers, furnaces etc.

5.5 PAINTS

Paints are applied on the surfaces of timber, metals and plastered surfaces as a protective layer and at the same time to get pleasant appearance. Paints are applied in liquid form and after sometime the volatile constituent evaporates and hardened coating acts as a protective layer.

Constituents of Paint

The essential constituents of paints are:

- | | | |
|----------------|---------------|--------------|
| 1. Base | 2. A vehicle | 3. A pigment |
| 4. A drier and | 5. A thinner. | |

- 1. Bases:** It is a principal constituent of paint. It also possesses the binding properties. It forms an opaque coating. Commonly used bases for paints are white lead, red lead, zinc oxide, iron oxide, titanium white, aluminium powder and lithophone. A lead paint is suitable for painting iron and steel works, as it sticks to them well. However it is affected by atmosphere action and hence should not be used as final coat. While zinc forms good base but is costly. Lithophone, which is a mixture of zinc sulphate and barytes, is cheap. It gives good appearance but is affected by day light. Hence it is used for interior works only.
- 2. Vehicles:** The vehicles are the liquid substances which hold the ingredients of a paint in liquid suspension and allow them to be applied on the surface to be painted. Linseed oil, Tung oil and Nut oil are used as vehicles in paints. Of the above four oils, linseed oil is very commonly used vehicles. Boiling makes the oil thicker and darker. Linseed oil reacts with oxygen and hardens by forming a thin film.
- 3. Pigment:** Pigments give required colour for paints. They are fine particles and have a reinforcing effect on thin film of the paint. The common pigments for different colours are: Black—Lamp black, suit and charcoal black.

Red—venedion red, red lead and Indian red.

Brown—burned timber, raw and burned sienna

Green—chrome green, copper sulphate.

Blue—prussian blue and ultra marine

Yellow—ochre and chrome yellow.

4. The Drier: These are the compounds of metal like lead, manganese, cobalt. The function of a drier is to absorb oxygen from the air and supply it to the vehicle for hardening. The drier should not be added until the paint is about to be used. The excess drier is harmful because it destroys elasticity and causes flaking.

5. The Thinner: It is known as solvent also. It makes paint thinner and hence increases the coverage. It helps in spreading paint uniformly over the surface. Turpentine and naphtha are commonly used thinners. After paint applied, thinner evaporates and paint dries.

Properties of an Ideal Paint

1. It should be possible to apply easily and freely.
2. It should dry in reasonable time.
3. It should form hard and durable surface.
4. It should not be harmful to the health of workers.
5. It should not be easily affected by atmosphere.
6. It should possess attractive and pleasing appearance.
7. It should form a thin film of uniform nature *i.e.*, it should not crack.
8. It should possess good spreading power.
9. It should be cheap.

Types of Paints

Depending upon their constituents there are various types of paints. A brief description of some of them which are commonly used are given below:

- 1. Oil Paint:** These paints are applied in three coats—primer, undercoat and finishing coat. The presence of dampness while applying the primer adversely affects the life of oil paint. This paint is cheap and easy to apply.
- 2. Enamel Paint:** It contains white lead, oil, petroleum spirit and resinous material. The surface provided by it resists acids, alkalies and water very well. It is desirable to apply a coat of titanium white before the coat of enamel is applied. It can be used both for external and internal walls.
- 3. Emulsion Paint:** It contains binding materials such as polyvinyl acetate, synthetic resins etc. It dries in $1\frac{1}{2}$ to 2 hours and it is easy to apply. It is more durable and can be cleaned with water. For plastered surfaces, first a coat of cement paint should be applied and then the emulsion paint. Emulsion paint needs sound surfaces.
- 4. Cement Paint:** It is available in powder form. It consists of white cement, pigment and other additives. It is durable and exhibits excellent decorative appearance. It should be applied on

rough surfaces rather than on smooth surfaces. It is applied in two coats. First coat is applied on wet surface but free from excess water and allowed to dry for 24 hours. The second coat is then applied which gives good appearance.

- 5. Bituminous Paints:** This type of paint is manufactured by dissolving asphalt or vegetable bitumen in oil or petroleum. It is black in colour. It is used for painting iron works under water.
- 6. Synthetic Rubber Paint:** This paint is prepared from resins. It dries quickly and is little affected by weather and sunlight. It resists chemical attack well. This paint may be applied even on fresh concrete. Its cost is moderate and it can be applied easily.
- 7. Aluminium Paint:** It contains finely ground aluminium in spirit or oil varnish. It is visible in darkness also. The surfaces of iron and steel are protected well with this paint. It is widely used for painting gas tanks, water pipes and oil tanks.
- 8. Anti-corrosive Paint:** It consists essentially of oil, a strong drier, lead or zinc chrome and finely ground sand. It is cheap and resists corrosion well. It is black in colour.

Application of Paint

Preparation of surface for application of paint is the most important part in painting. The surface to be painted should not be oily and it should be free from flakes of the old paint. Cracks in the surface should be filled with putty and then with sand paper. Then primer is applied. Painting work should be carried out in dry weather. The under coats and first coats must be allowed to dry before final coat is applied.

5.6 DISTEMPERS

Distempers are the cheaper variety of paints in which chalk is used as base and water is used as a carrier. The emulsifying agent which is commonly used is glue or casein. Distempers are available in powder form or in the form of paste. They are to be mixed with hot water before use.

The surface to be distempered should be thoroughly rubbed and cleaned. The cracks, if any, should be filled by lime putty. The surface should be kept dry for about two months before applying distemper. Thus a primary coat is applied and is allowed to dry. Distemper is usually applied in two coats.

Properties of Distemper

1. They are generally light in colour.
2. The coatings are generally thick.
3. They give reflective coating.
4. They are less durable than oil paints but are cheaper.

5.7 VARNISHES

Varnish is the solution of resins or resinous substances like amber, copal, shellac, gum resin etc. in solvents like oil, turpentine, alcohol etc. Depending upon the solvents used varnishes are classified as,

oil varnishes, turpentile varnishes, spirit varnishes and water varnishes. The desirable characteristics of an ideal varnish are

1. It should give glossy surface.
2. Should be durable.
3. It should dry rapidly after application.
4. It should not develop cracks after drying.

It is commonly used on wooden surfaces.

5.8 SOLID AND HOLLOW CONCRETE BLOCKS

Solid and hollow concrete blocks are manufactured in factories to meet the requirements of building blocks in cities and towns. These blocks may be called as artificial stones, since they replace the stones in the masonry construction. They are manufactured with lean mixes of cement, sand and aggregates of sizes less than 12 mm. Instead of sharp edged aggregates, round aggregates are professed in the manufacture of these blocks. The properties and uses of these blocks is given in this article.

(i) **Solid Concrete Blocks:** Solid concrete blocks of size 400 mm × 200 mm × 150 mm are commonly manufactured. To reduce the weight of the block no fine concretes are preferred. No fine concrete is the concrete in which fine aggregate is not used, but round aggregates of size less than 12 mm are used. IS:2185 (part I) 1983 covers the requirement, for such blocks.

The blocks should satisfy the strength requirement of 4 N/mm². Their density should be as low as possible, so that handling is not difficult. They should have sharp edges which are at right angles to each other.

These blocks are used for load bearing wall construction also.

(ii) **Hollow Concrete Blocks:** To reduce the weight of concrete blocks, they may be made hollow as shown in Fig. 5.1. Hollow blocks of sizes 400 mm × 200 mm × 190 mm (nominal size 400 × 200 × 200 mm) and also of sizes 400 mm × 300 mm × 190 mm (nominal size 400 × 300 × 200 mm) are manufactured. IS:2185 (part I) 1983 covers the specifications for these blocks.

These block need richer mixes. Fine aggregates upto 60% and coarse aggregates upto 40% are used.

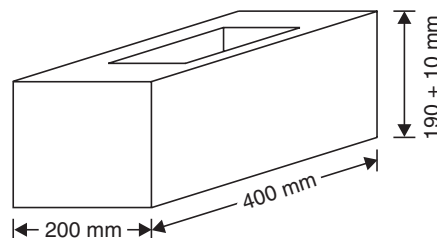


Fig. 5.1. Hollow concrete block