UNIT 5 PAINTS AND VARNISHES

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5.1 INTRODUCTION

The paints, distempers and varnishes are provided as a part of the final treatment to all the surfaces of walls, ceilings, floors, wood work etc., both internally and externally. Some more forms of finishes/treatments are also used depending upon requirement. These building treatments perform two major functions:

(i) They provide a protective coating to the surfaces. This helps in preserving and protecting the materials used in the building construction from environmental effects like heat, frost and rain water.

(ii) They provide decorative finish or treatment which adds to the aesthetic appearance of the surfaces and the building.

In this unit, our emphasis will be on paints, distempers and varnishes and we will be studying their functions, characteristics, types, constituents and process of application.

Objectives

After studying this unit, you should be able to

- explain the functions of paints, varnishes and distempering,
5.2 PAINTS

Paints are used to protect metals, timber or plastered surfaces from the corrosive effects of weather, heat, moisture or gases etc. and also to improve their appearance.

5.2.1 Functions of Paint

Paint performs following functions:

(i) It protects wood from decaying.
(ii) It prevents corrosion of metals.
(iii) It renders surface hygienically safe and clean.
(iv) It gives decorative and attractive appearance to the surface.
(v) It also protects the surface from harmful effects of atmospheric agencies.

5.2.2 Characteristics of an Ideal Paint

An ideal paint should have the following characteristics:

(i) The paint should be cheap.
(ii) It should be easy and harmless to the user.
(iii) It should retain its original colour for a long time.
(iv) It should be able to cover maximum area of the surface with minimum quantities.
(v) The painted surface should dry neither too slowly nor too rapidly.
(vi) When applied, the paint should form a thin uniform film on painted surface.
(vii) The paint should form a hard and durable coat on the painted surface.
(viii) The paint should not peel off from painted surface.
(ix) It should be good fire and moisture resistant.
(x) The painted surface should not show any cracks.
(xi) The painted surface should possess attractive and decorative pleasing appearance.
(xii) Atmospheric agencies should not be able to affect the painted surface.

5.2.3 Constituents of an Oil Paint or Oil Borne Paints

An oil paint essentially consists of the following ingredients:

(i) A base
(ii) An inert extender or filter
(iii) A vehicle or carrier
(iv) A drier
(v) A solvent or thinner
(vi) A colouring pigment

**Base**

It provides body to the paint and on it depends upon the nature of paints to a great extent. A base in general should possess the following properties:

(i) It is the solid matter forming the main body of the paint.
(ii) It makes the paint film harder and more resistant to abrasion.
(iii) It reduces shrinkage cracks formed on drying.
(iv) It forms an opaque layer to obscure the surface of material to be painted.

White lead, Red lead, Zinc oxide, Iron oxide, and metallic powders such as Aluminium, Copper and Bronze etc. are the commonly used bases.

**An Inert Extender or Filter**

They are added in the paint to reduce the cost and also to modify some of the properties of the paints. They reduce weight of the paint and render paint more durable. They should not be used in excess amount as otherwise paint may lose its original character and may become weak.

Barium sulphate silica, lithophone, whiting, charcoal, gypsum silicate of magnesia or alumina etc. are the usual inert extenders.

**Vehicles or Carriers**

They are liquid substances which hold solid ingredients of the paint. In general vehicles or carriers possess the following properties:

(i) It is an oily liquid in which the base and pigment are soluble.
(ii) It facilitates the paint to be conveniently spread evenly over the surface by means of a brush.
(iii) It acts as a binder for the base and causes it to stick to the surface.
(iv) On drying, it forms a tough and an elastic film. Oils most commonly used as vehicles are linseed oil, poppy oil, nut oil and tung oil.

**Driers**

These are metallic compounds which when added to the paint in small quantities accelerate the process of drying of the paint. Driers have a tendency to affect the colour of the paint and also to destroy the elasticity of the paint. Hence, they should not be used in excess amount. They are not used at all in final finishing coat of the paint. Driers should not be used in a paint that dries well.

Litharge, manganese dioxide, lead acetate and cobalt are the usual driers, out of which litharge is most commonly used.

**Solvents or Thinners**

A liquid thinner is added to the prepared paints to increase their fluidity to the desired consistency so as to make them work more smoothly and also to help penetration of porous surfaces. It evaporates after the paint has been
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applied to the surface. It also helps the paint in its penetration into the surface to be painted.

Turpentine oil, petroleum spirits and naphtha are mostly used as solvents or thinners.

Colouring Pigments

These are colouring agents which are used to develop desired shade of the paint. For white, black and other very dark shades, the base of the paint is chosen in such a way that, it will develop the colour of the paint through base itself. In case of other shades, colouring pigments of desired shade are mixed with the paint. Colouring pigments may be divided into five divisions.

(i) Precipitates
(ii) Natural earth
(iii) Calcined colours
(iv) Lake colours
(v) Metallic powders

Various colouring pigments to develop a particular colour are as follows:

(i) Blue
(ii) Brown
(iii) Black
(iv) Green
(v) Yellow
(vi) Red

5.2.4 Types of Paints

The paints are of following types:

(i) Aluminium Paint
(ii) Anti-Corrosive paints
(iii) Asbestos paints
(iv) Bituminous paint
(v) Bronze paints
(vi) Cellulose paint
(vii) Casein paint
(viii) Cement paint
(ix) Enamel paint
(x) Emulsion paint
(xi) Graphite paint
(xii) Plastic paints
(xiii) Silicate paint
(xiv) Luminous paint
Details of each of these paints are described below:

**Aluminium Paint**

The paint is prepared by holding very finely ground aluminium in suspension either in quick drying spirit varnish or slow drying oil varnish as per the requirements of the surface to be painted. The suspension liquid is spirit or oil, evaporates and a thin metallic film of aluminium is left on the surface. This paint is used for painting wood work and metal surfaces. It is widely used for painting hot water pipes, gas tanks, marine piers, oil storage tanks, radiators, etc.

**Anti-corrosive Paint**

These paints are used mainly to protect the surface of metallic structural steel work, against the negative effects of acids, corrosive chemicals fumes etc. There are several paints which exhibit these properties. These paints essentially consist of the linseed oil, as vehicle and red lead, zinc oxide, iron oxide, zinc dust, zinc chromate etc. as their base. These paints are cheap, durable and are usually black in colour.

**Asbestos Paint**

This paint is used for stopping leakage of metal roofs and painting gutters, spouts, flashings etc. to prevent their rusting. The paint is also used as damp proof coat to cover the outer face of the basement walls. This paint can withstand the effects of acidic gases and steam.

**Bituminous Paint**

This paint consists of asphalt, bitumen or pitches, dissolves in any type of oil or petroleum. The paint is always black in colour but its colour can be modified by mixing certain pigment like red oxide etc. in it. The paint is used mostly for painting iron-works under water. These paints deteriorate when exposed to direct sun. It is also used for water proofing.

**Bronze Paint**

These paints are prepared by disbursing aluminium bronze or copper bronze in nitro-cellulose lacquer as vehicle. They produce a very reflective type of surface and hence very useful for being applied on radiators. These paints are equally effective for painting interior or exterior metallic surfaces.

**Cellulose Paint**

This type of paint is prepared from cellulose sheets, nitro-cotton and photographic films. This paint dries very quickly and provides a flexible, hard and smooth surface. The paint does not harden by oxidation but by evaporation of thinning agent. The surface of the paint can be easily washed and cleaned. It remains unaffected by hot water, smoky or acidic atmosphere. This paint is used for painting cars, aeroplanes etc.

**Casein Paint**

Casein is a product extracted from milk curd. Casein paint when mixed with base like whiting, titanium, lithophone, etc. forms the paint which is usually available in powder or paste form. This paint has high capacity and can be applied on new plaster work. It is usually used on walls, ceilings wall
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boards, cements block construction etc. to increase the appearance of the surface.

**Cement Paint**

This paint is available in powder form. It consists of white or coloured cement as its base and water acts as a vehicle. No oil or varnish is added to it. This paint is available in variety of shades. It is durable and water-proof. This paint proves to be useful for surfaces which are damp at the time of painting and are also likely to remain damp after painting.

**Enamel Paint**

This paint is prepared by adding base like white lead or zinc white to a vehicle which is a varnish. To obtain the desired colour, colouring pigments may also be added. This paint dries slowly and forms a hard, durable, smooth, glossy, solid thin film. Enamel paints can be used both for interior as well as exterior painting.

**Emulsion Paint**

This paint consists of synthetic resin like polyvinyl acetate. It can be applied easily. It retains its colour for a very long time. The surface of the paint is tough and can be cleaned by washing with water. This paint has excellent resistance against action of alkali. It dries very quickly in about one to two hours.

**Graphite Paint**

It is black in colour. It is used over the surface which come in contact with ammonia, chlorine, sulphur gases, etc. It is very much used in under ground railways.

**Plastic Paint**

This paint contains a variety of plastics in suspension and is available in the market under different trade name. It is mostly used in show rooms, display rooms, and auditorium etc. It can be applied by spray or by brush.

**Silicate Paint**

It is prepared by mixing calcium and finely ground silica with resinous materials. It forms a very hard and durable film on painted surface. It can be directly applied on brick, concrete or plastered surface, but only after wetting them.

**Luminous Paint**

This paint is prepared by mixing calcium sulphide with varnish. This paint shines in darkness like radium dials of watches. This paint should be applied on surface which have been rendered free from corrosion or lead paints in particular.

**Inodorous Paint**

This paint consists of white lead or zinc white mixed with methylated spirit. No turpentine is used in this paint. White lead or zinc white is ground in oil. Shellac with same quantity of linseed oil and castor oil is dissolved in methylated spirit and this mixture is mixed with lead or zinc white paste prepared in linseed oil. This paint dries quickly, but is not durable.
Rubber Paint

This paint is prepared by treating rubber with chlorine gas (chlorinated rubber) and then dissolving it in suitable solvent. This paint can be used on new concrete and lime plastered surfaces. This paint dries quickly. It is little affected by weather and sunlight. It is resistant against chemical actions, water, etc.

5.2.5 Painting Processes

Application of paint to a surface either with a brush or by spraying is known as painting. The surface to be painted should be perfectly smooth, clean and dry. Presence of moisture between the paint and surface to be painted or between successive coats of paints causes blisters. Painting should as far as possible be carried out in dry weather.

Brush of only good quality, the hair of which do not come off while painting, should be used.

The paint is applied on the surface in two, three or four coats. The first coat is known as priming coat and last one as finishing coat. All the intervening coats are known as under coats.

Prime coat forms a thin film which helps in adhesion of the paint with the surface. It also protects the surface from weathering action. Materials for priming coat should be selected keeping in view the nature of the surface to be painted.

Under coats serve as foundation on to the finishing coat. These coats fill all the irregularities of the surface.

Finishing coat is lastly applied as per the requirements.

5.2.6 Painting on Plastered Surface

A plastered surface should be painted only after it has thoroughly dried, otherwise the paint would get sploxet. The following factors should be kept in mind while painting a plastered surface:

(i) As far as possible fresh plastered surfaces should not be painted. At least 6 months to 12 months time should be given to the plastered surface to dry completely.

(ii) Fresh plaster is alkaline in nature, because lime is liberated during the hydration of cement. Oil based paints and distempers are prone to alkali attack in the presence of moisture. Hence, if freshly plastered surface is to be painted, an alkali resistant primer paint should be applied or alternatively paints not containing any oil should be used.

Spots of plastered surface showing efflorescence should be brushed off. If spots appear again, they should again be brushed off and painting should be postponed till such spots cease to appear.

In case of new plastered surfaces, a solution of one kilogram of zinc sulphate in two kilograms of water should be applied to the surface. When it has dried then a coat of pure raw linseed oil is applied. It is followed by two coats of paint thinned with turpentine and a little varnish. Third coat consisting of white lead, linseed oil, desired pigment and a little oil of turpentine is then applied. Finishing coat may be the same as third coat but with a little more of turpentine oil.

However, these days paints are available in market that can be applied directly on newly plastered surfaces. These are known as cement paints.
5.2.7 Painting on Concrete Surfaces

For painting concrete surfaces, cement paints are used. They are available in powder form. They are used by mixing with water. Prepared paint should be consumed within 2 hrs or its preparation. Two coats should be applied at an interval of 24 hrs. The painted surface should be cured by sprinkling water at intervals.

5.2.8 Defects in Painting

The following defects may occur in painted surface:

Fading

The paint may lose some of its colour due to effects of sunrays on colouring pigments.

Flaking

Due to poor adhesion, paint may peel off from the surface.

Grinning

If the opacity of the final coat is insufficient, the back ground of the painted surface is clearly visible. This defect is known as grinning.

Bloom

Due to bad ventilation or defective paint, dull patches are developed on the painted surface.

Flashing

This is opposite of bloom. In this defect, glossy patches are developed on the painted surface. The reason of this defect may be cheap paint, weather reaction or poor workmanship.

Blistering

This defect occurs due to trapped moisture behind the painted surface.

Running

This defect occurs when the surface to be painted is very smooth. In this defect, small areas of the surface are left uncovered with paint.

Sagging

Thickness of painting should not be excessive. If too much thick coat of paint is applied, the defect is known as sagging.

Wrinkling

This defect occurs in thickly painted surfaces.

Saponification

Defect of formation of soap patches on the painted surface is known as saponification. This defect occurs due to chemical action of the alkalies.

5.2.9 Failure of Paint

When paint applied on the surface does not perform its purposes, it is called failure of the paint. Painting is an easy job but also has its own peculiarities. The following are the main causes of failure of paint.

Bad Workmanship
Painters are generally in habit of thinning the paint too much so that he may save paint and labour both. This leads to bad workmanship and it is possible that paint may be absent for portions of surface.

Wrong Choice of Paint

Choice of paint is done based upon climatic conditions, nature of surface to be painted and so many other factors affecting the performance of the paint. Low quality paints are cheap but their durability is very poor.

Surface Penetration

If the surface to be painted has not been prepared well to receive the paint, it may lead to failure of the paint.

Moisture

Leakage of moisture on any painted surface accelerates the process of separating the paint layer from the surface.

Salts and Alkalies

The movement of moisture can also transport salts from either internal volume of masonry or new deposits. Such salts and alkalies saponify the oil paints.

Conditions for Painting

The painting should be done when atmospheric conditions are favourable. Dirt, dust and moisture must not get entrapped during the process of painting.

SAQ 1

(a) Briefly describe the characteristics of an ideal paint.
(b) Explain the various defects which may develop in painting.
(c) Explain the method of painting on concrete surfaces.
(d) Describe the functions of each ingredient of an oil paint.
(e) Explain in brief the painting process.
(f) Describe the reasons of failure of paints.

5.3 DISTEMPERING

It is also a process of applying wash or coating like white washing or colour washing on the surface. Finished surfaces obtained by distempering are far superior than those obtained by white washing or colour washing. Distempers are available in ready made form in the market under different trade names.
5.3.1 Composition of Distempers

Any distemper consists of a base, a carrier, colouring agent, and size. Whiting (powdered chalk) is used as base and water as the carrier. Colouring agents or pigments are added only, if specific shade is to be obtained. Glue is mostly used as size.

Distempers may also be termed as a water paint, having whiting as base and water as the carrier. Distempers are available in powder form or paste form. They are to be mixed with hot water before use. There is a variety of oil bound distempers also, in which the drying oil is so treated that it mixes with water readily.

Distempers are applied on the surface with the help of distemper brushes which are about 10 cm wide.

5.3.2 Process of Distempering

Distempering a surface involves following operations:
(i) Preparation of the surface
(ii) Applying prime coat
(iii) Distempering

Preparation of the Surface

Surface to be distempered should be absolutely dry. Dampness in the surface spoils the distemper coat. Holes, patches, cracks, efflorescence spots etc. should be thoroughly cleaned and filled with gypsum or lime putty. If the surface is to be redistempered the old coating should be washed with water and allowed to dry completely. The surface in the last should be thoroughly rubbed with sand paper and cleaned.

Applying Prime Coat

After preparation of the surface, it should be primed by applying a coat of whiting in water or only of milk. Priming coat helps in developing a good bond of distemper with the surface. The priming coat should be allowed to dry completely, before distemper coat is applied over it.

Distempering

After having applied the priming coat, first coat of distemper is applied on the surface. The first coat should be of a light tint and applied with great care. Second coat is applied after the first coat has dried and become hard. Distempering coats are applied with the help of broad stiff distemper brushes. Now-a-days, distempers can be applied with the help of spray pistols also.

5.3.3 Properties of Distempers

(i) Distempers generally shrink on drying. Hence, if the surface receiving distemper is weak, it may lead to cracking and flaking of the distempers.

(ii) Distempers are available in powder form and also in paste form. Powdered distempers are known as dry distempers, whereas paste form distempers are known as oil bound distempers. Oil bound distempers are superior than dry distempers.
(iii) Coatings of distempers are comparatively thick and are more brittle than other water paints.

(iv) Distemper film is generally porous in nature and it allows water vapour to pass through it. Hence it allows new walls to dry out without damaging the distemper film.

(v) They are less durable than oil paints.

(vi) Distempers are generally light in colour and provide a good reflective coating.

(vii) They can be applied on cement plastered surface, lime plastered surface, brick work, insulating boards, etc.

SAQ 2

(a) Write down the properties of a good distemper.

(b) Explain the procedure of application of distemper on a surface.

5.4 VARNISHES

Varnish is a solution of some resinous substance in alcohol, oil or turpentine. The process of covering the surface with varnish is known as varnishing. Varnishing is done only on wooden surface.

5.4.1 Functions of Varnish

Varnish performs the following functions:

(i) It brings about brilliance to the painted surface.

(ii) It protects the surface against adverse effects of the atmosphere.

(iii) It increases the durability of the paint film.

(iv) It beautifies the surface without hiding the beautiful grains of the wood.

Varnish plays an important part in finishing wooden surfaces of doors, windows, floors, furniture, etc.

5.4.2 Properties of Good Varnish

A good varnish should possess the following properties:

(i) It should not hide the natural grains of the surface.

(ii) It should not shrink or show cracks after drying.

(iii) It should make the surface glossy.

(iv) It should dry rapidly.

(v) It should impart the finished surface uniform colour and pleasing appearance.
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(vi) The thin film of varnish developed after drying on the surface should be tough, hard and durable.
(vii) The natural colour of the varnish should not fade away when varnished surface is exposed to atmospheric action.

5.4.3 Constituents of the Varnish

A varnish has usually three elements:

(i) Resins or resinous material
(ii) Driers
(iii) Solvents

Resins or Resinous Material

Quality of varnish depends much upon the quality of resin used. Copal, lac, amber and rosin are the commonly used resins for varnishes. Copal is considered to be best.

Driers

Driers are used to accelerate the process of drying of the varnish. Litharge, lead, acetate, and white copper are the various types of driers, out of which litharge is mostly used.

Solvents

Selection of solvent is made depending upon the type of resin.

Table 5.1

<table>
<thead>
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<th>Sl. No.</th>
<th>Name of Resin</th>
<th>Solvent Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amber and copal</td>
<td>Linseed oil</td>
</tr>
<tr>
<td>2</td>
<td>Lac</td>
<td>Methylated spirit</td>
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</tbody>
</table>

5.4.4 Types of Varnish

The varnishes can be classified into following categories depending upon the solvent used:

(i) Oil Varnish
(ii) Spirit Varnish
(iii) Turpentine Varnish
(iv) Water Varnish
(v) Asphalt Varnish
(vi) Spar Varnish
(vii) Flat Varnish

Oil Varnish

This type of varnish is manufactured by dissolving hard resins such as amber and copal in linseed oil. Turpentine may be used in small quantity to thin the varnish, and also to render it workable. Oil varnishes form a hard and durable film, but they dry slowly.

Spirit Varnish
This type of varnish is prepared by dissolving resins such as lac or shellac in methylated spirit. This varnish dries very quickly and gets easily affected by weather action. This varnish is mostly used for wood furniture.

**Turpentine Varnish**

In this type of varnish, gum, dammar, mastic, and rosin like resins are dissolved in turpentine. These varnishes are light in colour and dry quickly.

**Water Varnish**

This varnish is prepared by dissolving shellac in hot water. Shellac does not dissolve readily in water and as such to accelerate the process of dissolving shellac in water either ammonia or potash, or soda or borax is added. This varnish is used for painting pictures, posters and maps.

**Asphalt Varnish**

This varnish is obtained by dissolving melted asphalt in linseed oil. The varnish may be thinned by adding suitable amount of either turpentine or petroleum spirit. This varnish is used for varnishing fabricated iron and steel product.

**Spar Varnish**

This varnish derives its name from its use. It is mostly used on spars and other exposed parts of the ships. It is very good weather resistant. It should not be used indoor.

**Flat Varnish**

This is an ordinary varnish to which material such as wax, finely divided silica and metallic soaps are added, to reduce the gloss of the varnished surface. This varnish presents a dull appearance.

**5.4.5 Process of Varnishing**

Following operations are required to be carried out while varnishing a wooden surface:

**Preparation of Surface**

The surface to be varnished should be thoroughly rubbed smooth by means of sand paper and thoroughly cleaned from dust and dirt.

**Knotting**

It is the process by which knots on the surface of wood work are killed by applying certain substance over the knots. All the knots should be covered with a hot preparation of red lead or glue size.

**Stopping**

After knotting, the surface of wood work is stopped by means of hot weak glue size. This coat fills all the pores of the surface. After stopping when surface becomes dry, it is rubbed again with sand paper.

**Applying Varnish Coats**

After stopping process, varnish is applied on the surface in very thin coats. Next coat is applied only when previously applied coat has dried. For varnishing, fine brittle varnishing brush should be used.

**SAQ 3**

(a) Briefly describe the functions of varnish.
(b) Explain the importance of varnishing a wood surface.
(c) Describe the process of varnishing in brief.

5.5 SUMMARY

The paints, distempers and varnishes not only adds to the aesthetic appearance, but also provides protective coating to the surface. In paints, enamel paint and plastic emulsion paint are the most favoured paints, while cement paints like snowcem remain popular as ever. Distempers are available in ready-made form in the market and are far superior than white washing or colour washing. Varnishes are used to bring about brilliance to the painted surface. Varnish plays very important role in finishing wooden surfaces of doors, windows, floors, furniture, etc.

5.6 ANSWERS TO SAQs

Refer the relevant preceding text in the unit or other useful books on the topic listed in Section “Further Reading” to get the answers of the SAQs.