

CCT 3114

Painting

Construction

STUDENT HANDBOOK

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The author created this for the student's guide on the course.

Painting Construction - CCT3114

What is Construction Painting



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.

Applying paint makes surfaces attractive and vibrant. In addition, paints and other sealers protect interior and exterior surfaces from weather, mold, and erosion.

Because there are several ways to apply paint, workers must be able to choose the proper tool for each job, such as the correct roller, power sprayer, and the right size brush. Choosing the right tool typically depends on the surface to be covered and the characteristics of the finish.

Role of Construction Painter

Construction painters do the following:

- Cover floors and furniture with drop-cloths and tarps to protect surfaces
- Remove fixtures such as pictures, door knobs, or electric switch covers
- Put up scaffolding and set up ladders
- Fill holes and cracks with caulk, putty, plaster, or other compounds
- Prepare surfaces by scraping, wire brushing, or sanding to a smooth finish
- Calculate the area to be painted and the amount of paint needed



- Apply primers or sealers so the paint will adhere
- Choose and mix paints and stains to reach desired colour and appearance
- Apply paint or other finishes using hand brushes, rollers, or sprayers

A few construction painters—mainly industrial—must use special safety equipment. For example, painting in confined spaces such as the inside of a large storage tank, requires workers to wear self contained suits to avoid inhaling toxic fumes.

When painting bridges, tall buildings, or oil rigs, construction painters may work from scaffolding, bosun's chairs, and harnesses to reach work areas.

Construction painters have distinct personalities. They tend to be realistic individuals, which means they're independent, stable, persistent, genuine, practical, and thrifty. They like tasks that are tactile, physical, athletic, or mechanical. Some of them are also conventional, meaning they're conscientious and conservative.

Because construction painters apply finishes to a wide variety of structures—from bridges to the interiors and exteriors of buildings—they may work both indoors and out.

Painting requires a lot of climbing, bending, kneeling, and stretching. Industrial construction painters typically work outdoors in dry, warm weather.

Those who paint bridges or building infrastructure may be exposed to extreme heights and uncomfortable positions; some construction painters work suspended with ropes or cables.

Paints as Materials and Techniques



Paint is a coating of fluid material applied over timber and metal surface as a protective coating which on drying forms a thin film on the surface. Paint is a mixture of liquid or medium and a coloring or pigment to impart color and provide protective coating to the surface.

Oil Base Paints are polymers or prepolymer solutions which form a film upon evaporation of the solvent. Paint is a dispersion of pigments in a drying oil, with addition of driers and thinners

History of Paints Materials and Techniques

Early Painting Methods

Paints are fun to use and great for creating art. But how did different kinds of paint develop?

To understand the history of painting materials and techniques, you should know some basic terms.

Paint is made of pigments, finely ground chemical or mineral powders, and a binder, a viscous or liquid

substance that allows the paint to be spread. Many popular pigments remained unchanged for centuries and are still used today. But over time, binders changed, providing different qualities that appealed to artists. Another evolving element was the support, or the surface on which the painting was created. Common supports include the wood panel, stretched canvas, and paper.

However, cultures worldwide from prehistory to the present have used many materials and techniques to paint, but we can't cover them all. In this lesson, we're focusing on several painting materials that have been important to Western art.

Tempera Painting.

The most common paint in early art was tempera paint, sometimes called egg tempera. It was made of pigment mixed with a binder of egg yolk and water.

Tempera wasn't the only painting method in the ancient world; some artists worked in encaustic, a difficult medium made of pigment mixed with melted beeswax. It was worked quickly and applied in many layers because it hardened as the wax cooled. Tempera was favored over encaustic because it was easier to mix, was easier to use, and resulted in bright colors. But it dried quickly and didn't blend well. Artists worked in quick, thin strokes, giving tempera paintings a precise linear quality. Tempera had a no-reflective matte surface, and it wasn't effective for dark or rich tones. It also formed a brittle surface when dry.

So, tempera painting was done on bulky wood panels prepared by coating them with gesso, a white absorbent material made of chalk or plaster and animal skin glue. Gesso helped the paint adhere to the support. If an artist wanted to make a large painting, they created it in sections and connected them later. Throughout the Middle Ages, artists created beautiful works in tempera. But then, a new paint superseded it.



Oil Painting.

Scholars don't know exactly who invented oil paints. Scattered early evidence shows oil-based paints in places like the Nordic world and ancient Afghanistan. By the early Renaissance period (roughly 1400 to 1479), some artists began coating tempera paintings with a thin layer of oil. When they did, they noticed the shinier surface added depth and brilliance to shadows and dark tones. This led to a new kind of paint.



Oil paint is made of pigment and a binder of natural oil like linseed or walnut. The paint had a thick, buttery consistency and dried slowly as the oil was exposed to air. This created a permanent, flexible surface. Some artists used oils on wood panels, but eventually another support was preferred. Stretched canvas, or fabric on a wooden frame support, was lighter than wood and could be made

in many sizes. The canvas was coated with gesso that could be tinted in many different colors. By the end of the 15th century, Renaissance artists had abandoned egg tempera for oil painting. It allowed them to create images with illusions of great depth and subtle areas of shade. Oils blended on the canvas, could be reworked for weeks, and were versatile for many kinds of brushstrokes. They were applied very thickly or in thin, transparent glazes. For the next five hundred years, oil paint became the favored medium of professional painters. It's what famous artists like Leonardo da Vinci, Rembrandt, Monet, and Van Gogh used to create their famous works.

Acrylic Paint

Not until the 20th century did a new painting method change how artists worked. Acrylic paint is made of pigment in a polymer emulsion. Essentially, it's plastic. It's water-soluble when wet and dries quickly to a permanent flexible finish. Acrylic paints can be thick like oil paints or thin enough to be used as an ink. Acrylic can replicate many painting techniques, including those found in tempera and oils.

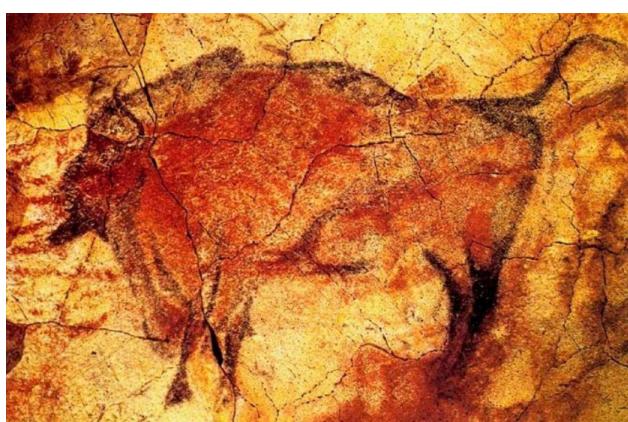


Acrylic paint developed in the 1940s as an industrial paint. But artists began using them and liked them. By the 1950s, fine art featured acrylics in brilliant colors. Their rise coincided with a time of change in art, and acrylic proved useful to artist experimentation. Acrylics could be dripped, poured, and used to paint large areas of bright colors with hard, precise

edges. Substances like sand or fibers were added to create interesting textures, and chemicals were added to make them dry slowly, allowing them to blend in subtle ways. Acrylic could also be used on any kind of support. At first, some artists considered acrylic less prestigious than oils, but today it's embraced for its versatility.

House Paint

Things were not always full of so many choices when it comes to house painting, interior painting or exterior painting. Let's take a trip back in history and see exactly how far back painting of living areas can be traced.



One can just imagine the caveman agonizing over the choice between “fire soot” grey and “bison blood” burgundy for his cave decor. Evidence shows that mankind has decorated his living space as far back as 40,000 years ago using what could be called paint. The material would be made from all-natural ingredients too!

Prehistoric paint was made from colored earth, soot, and organic materials mixed with animal blood and fatty oils. Recently archeologists discovered a site in South Africa that indicated that men (or women) used a yellowish-brown

clayey soil based coating which may have been used like paint.



Fast forward to Egypt only about 2,000 years ago. Brightly colored walls in Dendera have stood the test of time and still look as vivid today as when they were painted! We don't know of any modern day paints that offer that kind of guarantee. The Egyptians created six colors by mixing oil or fat with lead, earth, animal blood, ground glass or semiprecious stones. Their palate included white, red, yellow, green, black and blue. Intricate and elaborate paintings that illustrated their culture and history were painted along with furnishings and living spaces of the pharaohs and the ruling classes. Some of the best paintings were reserved for the Egyptian tombs as their belief in the afterlife called for.

Generally speaking the artisans and craftsmen were the ones that were commissioned to do the painting throughout history. The house painting profession was evident as early as the 1200's and many suspect that painters as a trade may even go back farther in time. But since Gutenberg did not invent the printing press until 1440 there is not much written history that scribes recorded in the first century regarding the house painters that may have existed.

In the fourteenth century house painters in England organized themselves in guilds. That was what really established house painting as a respected profession that held to certain standards of practice. They organized themselves into two groups, the "Painter's Company" and the Stainer's Company". Several hundred years later the two merged into what was called the "Worshipful Company of Painters and Stainers". Their paint mixing and application skills were actually regarded as closely held secrets to outsiders in order to protect their way of making a living.

House painting became something to be avoided if you were a part of the early American colonies. The Pilgrims considered painting your house to be a display of immorality, wealth and vanity. The practice was considered immoral by many and in 1630 a preacher that decorated his Charlestown home interior with paint was criminally charged with sacrilege. The demand for interior painting continued despite the puritan objections. Oil and water became the base that would be mixed with a wide variety of materials including lead, ground shells, iron or copper oxide, coffee, rice, eggs, fruits, berries and other vegetation to create many types and colors of paint. Paint producers cooked up their product despite the fact that it was illegal. Many homes were elaborately decorated with lifelike murals of sky, stone and landscape features painted on the walls, paneling, cornices and ceilings. The painting tools used during these times are very similar to today's brushes employing wooden handles with various types of hair attached. Modern brushes use synthetic fibers but the object was the same, to apply the paint to the surface with the appropriate thickness and stroke in order to ease the process and achieve the best finished result.

Many of the paints were quite thick and not at all like the easy to apply paint that we are accustomed to.

In 1718 Marshall Smith invented a “Machine for the Grinding of Colours” which sparked a race of innovation to create the best ways to grind pigment materials effectively and actually start manufacturing paint in a paint mill. By the mid 1800’s linseed oil began to be used as a less expensive binding agent that actually protected wood that was painted.



In 1866 the first company to produce ready-to-use paint was formed, Sherwin-Williams. Harry Sherwin, Alanson Osborn and Edward Williams formed Sherwin, Williams, & Co. in Cleveland, Ohio. Henry Sherwin later developed a tin can that consumers could reseal. In 1883, a competition that continues today started when Benjamin Moore began operations. The company put much emphasis on the chemistry to improve the color mixing and production throughout the

twentieth century and were the first to design the computer based color-matching system that we all are accustomed to back in 1982.

Modern House Painting. House painting developed significantly with the development of modern paints, which are latex- and polymer-based. These materials only began to be developed in the 20th century, when the first polymer was synthesized and the age of plastics began. These paints are hardier and easier to clean than older organic-based examples. You can choose paints that can be cleaned of scuffs and dirt more easily and stay glossy for years.

Today, a painting contractor has many options in terms of tools for getting clean lines across ceilings and floorboards. Foam rollers, painter's tape, and paint guns are all modern inventions that a painting contractor can use to make a house's paint job look professional and clean.

Because modern paint dries quickly, you can also have your home painted in a few days, with your furniture ready to move back in soon. You will also have a wide variety of color choices from a number of quality paint companies. So enjoy the choices you have today and make the most of your home with paints that can add life to your exterior house painting and enhance the mood of your interior house painting. The sky's the limit today when it comes to imagining the possibilities that are available and creating just the look that you desire.

Characteristics of an Ideal Paint

- The paint should be cheap.
- It should have good covering power. In other words it should be able to cover the maximum area of the surface with minimum quantities of the paint.
- It should be easy and harmless to the user.
- The painted surface should dry neither too slowly nor too rapidly.
- Atmospheric agencies should not be able to affect the painted surface.
- The paint should form a hard and durable coat on the painted surface.

- The painted surface should possess an attractive and decorative pleasing appearance.
- The painted surface should not show any cracks.
- It should be good fire and moisture resistant.
- It should retain its original color for a long time.
- When applied, the paint should form a thin uniform film on the painted surface.

Paints Functions

- To protect the surface from weathering effects of the atmosphere and actions by other liquids, fumes and gases
- To provide pleasing, colorful and decorative appearance to the surfaces
- To prevent decay of wooden members
- To prevent corrosion of metallic surfaces
- To provide a smooth surface for easy cleaning

Composition of Paint

Paints are prepared by intimately mixing various components in proper proportions. Following are essential components of paint.

(1.) The Vehicle: It is actually an oil which is dried on exposure to air. Hence it is also called a drying oil. Such oil is unsaturated in composition. On exposure to air, it gets saturated (and hence dries out). The drying oil or the vehicle has the capacity to keep the pigment and other components of paint in suspension or solution.

These ingredients get deposited in the film, made by the drying oil on the surface of an object. The most commonly used vehicle or drying oils are: Linseed oil, dehydrated castor oil, bleached oil, and fish oil.

Driers are those substances which are added to drying oils to accelerate the rate of drying. They act as catalysts in the oxidation process of the drying oils.

The linoleats, resinates, and naphthalenes of metals like lead, magnesium, and vanadium are commonly used drier.

Following are descriptions of the most commonly used vehicles and binders for paint:

- *Natural Drying Oils.* Drying oils harden by absorbing oxygen. The most important natural oils are linseed from flax seed (for many years the standard paint vehicle), tung oil (faster drying, good compatibility with varnish), oiticica oil (similar to tung), safflower (best non yellowing oil), soybean (flexible films), dehydrated castor (good adhesion, fast drying), and fish oil (considered inferior but cheap).
- Alkyds. These, the most widely used paint vehicles, are synthetic resins that are modified with various vegetable oils to produce clear resins that are harder than natural oils. Properties of the film depend on relative proportions of oil and resin. The film is both air drying and heat hardening.

- Latexes. Latex paints are based on emulsions of various polymers including acrylics, polyvinyl acetate, styrene-butadiene, polyvinyl chloride, and rubber. They are easy to apply, dry quickly, have no solvent odor, and application tools are easily cleaned with soap and water. The films adhere well to various surfaces, have good color retention, and have varying degrees of flexibility.
- Epoxy and Epoxy-Polyester. Catalyzed two-part, all-epoxy coatings are formed by addition of a catalyst to the liquid epoxy just before application (pot life a few minutes to a day). Films are as hard as many baked-on coatings and are resistant to solvents and traffic. Oil-modified epoxy esters, in contrast, harden on oxidation without a catalyst. They are less hard and chemically resistant than catalyzed epoxies, but dry fast and are easily applied. Epoxy-polyesters mixed just before use produce smooth finishes suitable for many interior surfaces and are chemically resistant.
- Polyurethanes. These produce especially abrasion-treatment, fast-hardening coatings. Two-component formulations, of variable pot life, are mixed just before use. One-component formulations cure by evaporation and reaction with moisture in air (30 to 90% relative humidity). Oils and alkyds may be added.
- Vinyl Solutions. Solutions of polyvinyl chloride and vinyl esters dry rapidly and are built up by successive, sprayed thin coatings. They characteristically have low gloss, high flexibility, and inertness to water but are sensitive to some solvents. Adhesion may be a problem. Weather resistance is excellent.
- Dryers. These are catalysts that hasten the hardening of drying oils. Most dryers are salts of heavy metals, especially cobalt, manganese, and lead, to which salts of zinc and calcium may be added. Iron salts, usable only in dark coatings, accelerate hardening at high temperatures. Dryers are normally added to paints to hasten hardening, but they must not be used too liberally or they cause rapid deterioration of the oil by overoxidation.
- Thinners. These are volatile constituents added to coatings to promote their spreading qualities by reducing viscosity. They should not react with the other constituents and should evaporate completely. Commonly used thinners

(2.) Base:

A base is a solid substance that forms the body of the paint. It consists of a very fine powder of a suitable material such as white lead, red lead, iron oxide, and titanium oxide, etc. The base material makes the paint's film harder, stronger, elastic, and safe against cracking and moisture. It makes the paint stable against Ultra Violet Rays as well.

(3.) The Pigments:

It is a coloring material added to the above components in order to impart a desired shade and color. Pigment is added in a finely powdered state.

In White color paints: White Lead, Titanium White, Lithophone are used as a pigment.

In Red Color: Red Lead, Venetian Red, Chrome Red, Natural Red Oxides of Iron are used as a pigment.

In Yellow Color: Chrome Yellow, Zinc Chromate, Yellow Ochres are used as a pigment.

In Brown Color: Oxides of Iron is used as a pigment.

In Blue Color: Pursian Blue, Paris Blue, Ultramarine, Cobalt Blue are used as a pigment.

(4.) Solvents (Paint Thinner):

They are also called Paint thinner, which reduces the viscosity of the paints to a great extent. Solvents (paint thinner) or added to paints in order to make its application easy, smooth, and uniform.

Petroleum, spirits, turpentine and coal tar hydrocarbons are some of the commonly used solvents or paint thinner.

(5.) Extenders:

They are also called fillers. A Filler is a substance which can be added to paints to increase its bulk volume without affecting its useful properties.

These materials (Fillers) are necessarily inert towards other components of paint. Commonly used extenders are: Chalk, gypsum, barite, silica and magnesium silicate.

Various Bases of Paints

- *White Lead*

It is largely used for all ordinary building painting works and available in the market perhaps very cheap. It is available in the market in both powder & stiff-paste form. Stiff Paste is made by mixing it with linseed oil. It can be easily applied, possesses good bulk, and has a greater covering power. It is dense, waterproof, permanent and has a good body to obscure the surface.

It is not suitable for metal work, however, most suitable on wood surfaces. White lead possesses poisonous substances. It gets discoloured on exposure to the air; therefore, it should always be kept covered. Consequently, white lead often gets used as an undercoat.

- *Red Lead*

Red Lead is an oxide of lead usually bright red in colour. It is available in the market in either powder or paste form made by grinding with linseed oil. It is considered as most suitable for painting iron surfaces and also as a priming coat on wooden surfaces. It solidifies very quickly when mixed with linseed oil; therefore it can also be used as a drier.

Lead paint is paint that contains lead. Lead is used for quick drying, increasing durability, maintaining a fresh appearance and resisting moisture that causes corrosion. Lead paint is poisonous and should not be used fresh. Precautions should be taken while scrapping old dry painted surfaces or while painting with spray machines.

- *Zinc white or Zinc Oxide*

It is an oxide of zinc and forms the base for almost all the zinc paints. It is a fine white zinc powder which is available in both dry as well as paste form by mixing with linseed oil. It is smooth, transparent, unaffected by weathering, not affected by sulphur compounds, and not poisonous. However, it is costly, less workable and less durable than paints containing white lead. When it gets hard, it forms the paint film very brittle and develops a tendency of surface cracks.

- *Iron Oxide*

It is an oxide of iron and forms the base of all iron paints. It is a pigment produced from haematite ore. The pigment is obtained by grinding & levitating the red or brown haematite. It is effective in preventing rusting of the iron surface when mixed with vehicle oil. It is cheap & durable paint, which is exclusively used for the priming coat on iron surface i.e. structural steel or iron.

- *Titanium White*

This material possesses intense opacity. It is non-poisonous and provides a thin transparent film. This pigment is chemically inert and it is not affected by heat, light and acids and it also has very high covering power. Due to its high refractive index titanium white possesses excellent hiding power and hence it is generally used as an undercoat in all sorts of exterior and interior organic coating.

- *Antimony White*

It is very nearly similar to titanium white but it differs from white shade. Antimony is a neutral white whereas Titanium White is bluish white. Another feature of antimony white is that it is not fast drying, but makes reasonably flexible films and has very low oil absorption, so it is considered to be a “lean” oil color.

- *Lithophone*

This pigment is obtained from the precipitate formed by mixing equal quantities of the solutions of barium sulphate and zinc sulphate under carefully controlled conditions. It is a dense white pigment, having a good covering power, and it tends to turn yellow when exposed to sunlight. The paint made with lithopone as its base is generally used as an undercoat. It is also used in cheap enamels. It should not be allowed to come in contact with water.

- *Aluminum Powder*

It is the base of all the aluminum paints. This paint is generally used for a priming coat of new wood work. It prevents working and cracking of wood. It is impervious and maintains the same moisture content in the wood, if painted with it.

Gloss Levels (Sheens) of Paint

Selecting the right gloss for your paint project can be challenging. Gloss is about shine. It describes how much light is reflected from the surface of the paint. If a painted surface is very smooth and glass-like, the reflection is perceived to be “shiny” or “glossy.” Conversely, a flat or low sheen paint has a rough surface profile after it dries. Light that hits such a surface is reflected and scattered in many different directions so it appears “flat” to the eye.

Why Gloss is important

The gloss level of paint can have a significant impact on both appearance and serviceability. Increasing gloss improves the durability of paints – including scrub-, stain- and moisture-resistance. However, higher gloss levels tend to highlight defects and imperfections on a surface.

Gloss level also affects color perception. The same color with a different gloss will appear as a different color. The color in a higher gloss paint will appear brighter and richer than the same color in a lower

gloss paint.

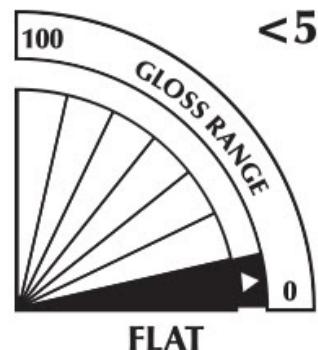
Low sheen paint versus high gloss which is better

It's not a question of which type of glossy, flat or low sheen paint is better, but which is suited for the correct job. Below, we take a look at a paint sheen chart and a definition for several types of paint such as flat, velvet, eggshell, low sheen, semi-gloss, gloss and high gloss and which uses they're best suited for in the home, workplace and outdoors.

What type of paint gloss is best

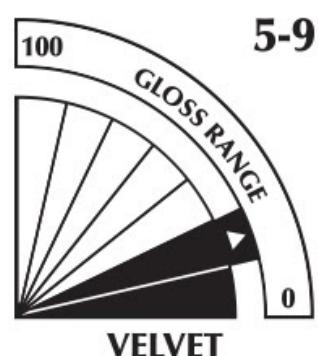
FLAT

Flat paints have the least amount of gloss so they help conceal surface imperfections better than other finishes and are ideal for walls that are rough or dented. They also touch-up better, which makes a flat paint an ideal choice for family rooms, living rooms, dining rooms and bedrooms. Flat paints are also a good choice for ceilings because of their low reflectivity. Stains can be difficult to remove from flat finishes, so it's best to use flat paints in areas that do not experience a lot of traffic.



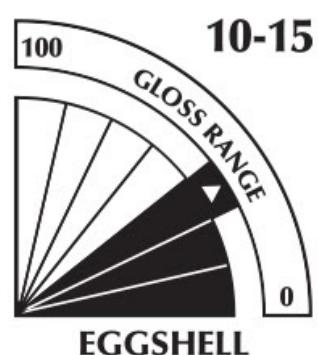
VELVET

Velvet paints resemble flat paints when viewed head on, but show a slight gloss when viewed at an angle. This slightly higher gloss provides for a more washable or scrubbable surface. These paints are ideal for areas with high traffic, such as hallways and kid's rooms.



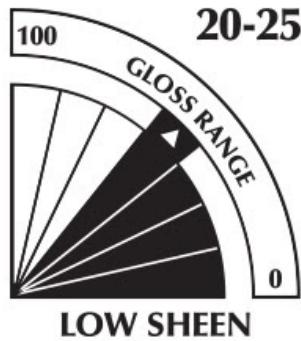
EGGSHELL

Eggshell paints are one step glossier than velvet paints. They convey a greater warmth and depth to surfaces than flat paints. Eggshell also tends to resist stains better than flat or velvet paint, although not as well as semi-gloss and high gloss paints. Like velvet paints, these paints are ideal for areas with traffic, such as dining rooms or a kid's room.



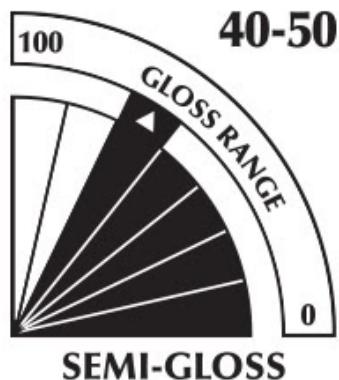
LOW SHEEN

Low sheen paints are similar to eggshell paints, but have a slightly higher gloss. They are a good choice for areas where some gloss is desired, but good cleaning properties are also necessary, such as, kitchens, laundry rooms and bathrooms. Their slightly glossy appearance, however, tends to highlight surface imperfections more than flat paints.



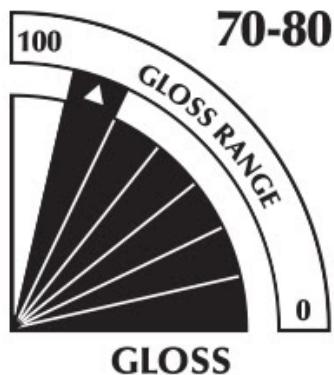
SEMI GLOSS

Semi-gloss paints have a slightly glossy appearance and are less reflective than gloss paints. They offer good stain resistance, are easy to clean, and are most often used in rooms requiring frequent scrubbing, such as kitchens and bathrooms. Semi-gloss is also a good alternative to gloss paints for use on windows, trim, cabinets and doors.



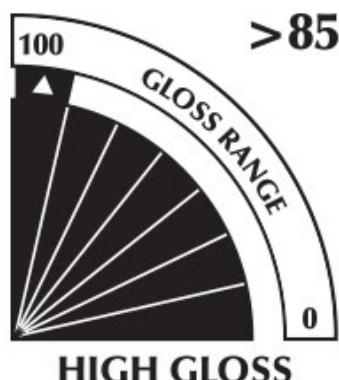
GLOSS

Gloss paints have a highly reflective appearance imparting a slick, contemporary look. They are tough, durable and stain-resistant. Gloss paints are easier to clean than lower gloss paints and are typically used in kitchens, bathrooms and on doors and cabinets exposed to fingerprints and grime. Because of its high reflection, gloss paint can highlight surface imperfections.



HIGH GLOSS

High gloss paints have the highest reflective appearance. They are the toughest, most durable and most stain resistant of all finishes. High gloss paints are the easiest to clean and are typically used on doors and cabinets exposed to dirt and oil and can also be used for trim and some woodwork. High gloss paint can emphasize surface imperfections.



Types of Paints

Paints are categorized into seven groups:

1. Oil Paints - These are the traditional type having a linseed oil medium and respectively termes as primes, undercoats and finishing coats. This paint is cheap and easy to apply and it possess good opacity and low glow.

It consists of Various Coats

- a. Priming Coat - Linseed Oil, White Lead, a small amount of red lead and extender (a white pigment used to increase bulk, prevent sedimentation and improve spreading)
The lead base is particularly suitable for external work
Leadless pigments are for internal use
- b. Finishing Coat - Oil Varnish, pigments of desired color and perhaps extenders and thinners finished vary from flat to oil-gloss.
- c. Under Coat - Linseed oil, white lead (tinted if required) and has a high quality of drying oil.

2. Synthetic Paints - the medium for these is a chemical compound, one type being an oil modified alkyd resin. They have the advantages over oil paints in setting more quickly and offering greater durability where corrosion is a danger. They also have a better flow and are easier to apply.
Drying is by evaporation of the solvent by oxidation and chemical change.

3. Emulsion Paints

An emulsion paint has the pigments and the medium dispersed as small globules in water.
Oil , synthetic resin and bitumen are common mediums.

The different emulsion paints are alkyd, bitumen, polyvinyl acetate and styrene emulsions.
They are used mainly on walls surfaces.

- Alkyd emulsion paints contain pigments, oil, and synthetic resins, they give a flat finish.
- Bitumen emulsions are those of bitumen in water plus pigments and extenders. They are for use on asphalt and bituminous surfaces.
- Polyvinyl acetate(p.v.a.)emulsion paints have a p.v.a. medium and give a finish from flat to eggshell gloss.
- Styrene emulsions incorporate the synthetic resin styrene in several forms and have a medium gloss

4. Cellulose Paints - These are synthetically reproduced from cellulose compounds and most of them have to be applied as a spray for they dry very quickly by evaporation of the solvent. Apart from some kinds of metal powders (aluminum and bronze) they are not satisfactory for general building work but can be used for furniture and fittings in houses. They are widely used in the motor car industry.

5. Varnishes are used to give a transparent film to a surface. Varnish is a nearly homogeneous solution of resin in oil, alcohol or turpentine. The type of solvent depends upon the type of resin used and is given in the table below. 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 acetate, etc. are used

Materials for making varnishes

Resin	Solvent
Amber, copal, gum anime	Boiled linseed oil
Common resin, gum dammer, mastic	Turpentine
Lac shellac, sandarch	Methylated spirit
Raw copal, cheaper types of resins	Wood naptha

Note: The commonly used resins are copal, lac or shellac and rosin. Copal is a hard substance and is available from the earth at places where pine trees existed in the past. It is available in a variety of forms. Lac or shellac is obtained by exudation of some types of insects in India. Rosin is obtained from pine trees.

Varnishes provide a protected coating and gloss to the surface and intensify the wood grains.

The objects of varnishing a surface are to:

1. Brighten the appearance of the grain in wood.
2. Render brilliance to the painted surface.
3. Protect painted surface from atmospheric actions.

Characteristics of an ideal varnish:

1. It should render the surface glossy.
2. It should dry rapidly and present a finished surface which is uniform in nature and pleasing in appearance.
3. The colour of varnish should not fade away when the surface is exposed to atmospheric actions.
4. The protecting film developed by varnish should be tough, hard and durable.
5. It should not shrink or show cracks after drying.

Varnishing - Varnish is applied as under:

Preparation of Surface. The wood work is made smooth by rubbing it with sandpaper and the surface is cleaned.

Knotting is the process of covering the knots in the woodwork, using any of the following methods.

Size knotting. A coat of red lead ground in water mixed with glue size is applied. After it dries another coat of red lead ground in oil and thinned by boiled turpentine oil is applied.

Patent knotting. Two coats of varnish prepared by dissolving shellac in methylated spirit or wine, are used.

Stopping. The surface of the wood work is then rubbed again and cleaned. Before rubbing, the surface is applied with a size of hot, weak glue.

Varnish Coat. Varnish is then applied in two coats. The second coat is applied after the first has dried.

Types of Varnishes - 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.
- Spar Varnish derives its name from its use on spars and other parts of ships. It gives a sticky effect in warm weather and is not used indoors.
- 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.
 - French Polish It is a type of spirit varnish, prepared by dissolving resin in methylated spirit at room temperature for use on hardwood substances to hide the grain defects. The surface is made smooth by rubbing. A filler mixed with desired colour is prepared to the consistency of a paste applied to the cracks, pores, etc. The surface is rubbed after drying and dusted off. Two coats of polish are then applied. The filler material is prepared by mixing 2 kg of whiting in 1.5 litres of methylated spirit or by mixing Plaster of Paris, red ochre and linseed oil.
 - Wax polish consists of bees wax dissolved in turpentine and is used for highlighting the grain over wooden surfaces. The polish is rubbed over the surface with rag until a bright appearance is obtained. Generally two coats are applied. It may also be used over marble with 1 part of it dissolved in 4 parts of hot turpentine or by mixing wax, linseed oil, turpentine oil and varnish in the ratio 2 : 1.5 : 1 : 05, by weight.
- Asphalt Varnish is made by dissolving melted hard asphalt in linseed oil with a thinner such as turpentine or petroleum spirit. It is used over shop fabricated steel works.
- Water Varnish is shellac dissolved in hot water to which enough quantity of either ammonia, borax, soda or potash is added. These are used for varnishing maps and pictures.

6. Water Paints (Distemper)

Water paint also known as 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

They are used mainly on internal walls and ceilings and most of them give a flat finish. There are several kinds prepared on the site by adding water to make a paste.

Distemper has a drying oil or varnish medium emulsified in water containing glue or other fixatives. Barytes is a common pigment along with tinting pigment. The cheapest type known as soft or ceiling distemper, contains only a glue size vehicle and tinted powdered chalk. It can be removed by washing or brushing and so is only used for ceilings.

Oil bound distemper is a better quality having a mixture of linseed oil, pigment and extenders. It will withstand limited careful washing.

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.

Distempering

Distempers are applied in the following manner:

Preparation of Surface: The surface is thoroughly rubbed and cleaned. In case of a new plastered surface, the surface is kept exposed, to weather, for drying before the application of distemper. If an existing (old) distempered surface is to be redone, the surface is cleaned with profuse watering. The efflorescence and patches, if any, should be wiped out by a clean cloth. Cracks, etc. if any should be filled with putty.

Priming Coat. A priming coat as recommended by the manufacturer is applied on the prepared surface.

Final Coat. Two or three coats of distemper are applied. Each coat should be applied only after the previous coat has dried.

7. Miscellaneous Paints

- a. Aluminum Paints. Consist of aluminium powder (as base) held in suspension by varnish. They are highly heat reflective and resistant to acid fumes. Aluminium paints are used for painting metal roofs, silos, machinery, poles, towers and storage tanks. It provides a very attractive appearance to the surface and the painted surface is visible even in darkness. Aluminium paints have high dispersive property—over 200m²/litre.
- b. Anticorrosive Paints. Linseed oil is used as a vehicle with dry red lead, sublimed blue lead, zinc oxide and iron oxide and zinc chromate as pigments. They are used for preservation of structural steel work against acid fumes and adverse weather conditions. The anticorrosive paints impede or obstruct the corrosion by reducing the direct access of air and water to the metal. These paints should have quick drying and hardening properties.
- c. Asbestos Paints. The main constituent is fibrous asbestos. These are used for stopping leakage in metal roofs, painting of spouts, gutters, etc. and sometimes on the outer surface of basement walls to prevent dampness. Asbestos paint is also called fire proof paint.
- d. Bituminous Paints are made of asphalt bitumen dissolved in mineral spirit or nephtha. They are black in colour, but suitable colouring pigments may be added for desired colour. They are alkali resistant and are used to paint exterior brick work, concrete and plastered surfaces and to reduce the moisture permeability. Bituminous paints are also used over iron works under water. When exposed to sunlight they deteriorate very fast.
- e. Bronze Paints. Generally a pigment such as aluminium or copper powder is used with a vehicle like nitrocellulose lacquer. They are highly reflective and are applied over radiators.
- f. Cellulose Paints are made by celluloid sheets, amyl-acetate substitute or nitrocotton dissolved in petroleum. Also known as lacquers, they are colloidal dispersion of cellulose derivative, resin

and plasticisers in solvent and diluents. Castor oil is also added to improve adhesion, toughness and smoothness of the paint film. A cellulose paint hardens by evaporation of the thinning agent, whereas an ordinary paint hardens by oxidation. Being very costly their use is restricted to painting cars, ships and airplanes. The trade names are spray paint, Ducco etc. Cellulose paints are not affected by adverse weather conditions.

- g. Casein Paints. Casein, a protein substance extracted from milk, curd, is mixed with a base like whiting and lithophone. They are available in powder or paste form. They are used over new plaster surface, walls and ceilings. A drying varnish is added when these are used over exterior surfaces of buildings. Casein paints can be tinted in any colour.
- h. Cement Based Paints (IS 5410) White or coloured Portland cement with (OPC minimum 65 percent) forms the base. They are thinned with water during application. Proper curing is necessary for strength and durability. Cement paints are durable, strong and display better water-proofing qualities and are used on exterior surfaces of buildings. Mixed with boiled linseed oil they are also used over corrugated iron sheets. To get good results, an aqueous solution of sodium silicate and zinc sulphate is applied as the primary coat on the surface to be painted.
- i. Rubber Based Paints Rubber treated with chlorine gas is dissolved in solvent and desired pigment is added. These paints are resistant to acid, alkalis and dampness. Rubber based paints are used over concrete and cement plastered surfaces.
- j. Plastic Emulsion Paints (IS: 5411 parts I & II) are essentially a dispersion of rubber-like resin polystyrene, and polyvinyl acetate in water and are prepared by grinding suitable pigments (titanium dioxide) in an emulsion of water (vehicle) and film forming drier, e.g., Co and Mn. Sometimes oil is used as a vehicle. In the former case the emulsifying agents are sodium or ammonium soaps whereas in the latter case metallic soaps of magnesium or zinc are used. Stabilizers such as proteins (dextrin, starch, casein) are added to impart chemical resistance to the emulsion. Moreover, protein provides the body thereby improving brushing. Antifoaming agents such as pine oil and kerosene are added to check any excessive foam formation by the agitation of emulsion paint during its manufacture. These paints should become surface dry within 15 minutes and hard dry within 4 hours and are alkali resistant. Plastic emulsion paints are useful in porous and/or wet surfaces. The emulsion coats are less odorous, non-inflammable, quick drying and easier to apply than other paints.
- k. Plastic Paints have plastics as base with water as thinner. They have high covering capacity and give a neat, decorative and pleasing appearance to the surface. Owing to their high cost The plastic paints are mainly used for interiors of auditoriums, showrooms, modern houses and offices. A typical composition of one litre of plastic emulsion paint is 0.20 kg of binder, 0.50 kg of pigment, 0.10 kg of other solids and 0.60 kg of water. On drying, the water evaporates leaving behind a smooth film. One litre of plastic paint covers about 15 m² of wall surface per coat.

Application of Paint

Preparation of the 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 sandpaper. 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 the final coat is applied.

Painting Techniques

By Brush

- Correctly prepared the surface and using a good quality brush, the top of the brush is dipped in the paint and the excess removed by drawing it against the edge of the tin.
- Working from right to left a narrow strip of the work is covered with vertical brush strokes, the area is then “crossed”.
- The surface is then finally “laid off”.
- A strip must be joined to its neighbour as soon as possible and the work so arranged that the surface is finished without interruption.

Spray Painting

- It is an alternative technique essential for cellulose paint.
- Simple spray equipment comprises a motor and fan giving a current of air delivered by tube to a container and spray gun.
- The gun has a nozzle from which the paint is forced in a fine spray when a trigger is depressed.
- An air compressor is used in large equipment.
- Painting by spray is quicker for large areas than brushing.
- It also uses less paint for this has to be thinner.

Basic of Primers in Construction Painting

Primer paint is a preliminary layer of coating that is applied on the materials prior to the paint. It ensures that the paint adhesion to the surface is proper, enhances the durability of paint, and imparts extra safety to the surface being painted. Primer also seals the pores in the permeable materials, and averts bleeding from knots. If suitably applied, primers will enhance the life of the paint, and also improve the appearance.

Uses of a Primer for Painting

All incomplete surfaces are required to be primed prior to painting, including dry walls, concrete, wood, and metal. Application of paint to unprimed surfaces may cause additional peeling and development of cracks, compared to when the paint is applied to suitably primed surfaces. Therefore, though this process of priming may cause additional expenditures, preferably it must not be omitted.

Surfaces that have been previously painted may not need priming, unless the oil based paints are being changed to latex paint, or the paint already applied has deteriorated. The surfaces that have deteriorated should be cleaned suitably before the application of primer.

Proper preparation of the surfaces will ensure better adhesion of the primer. Surfaces that have oil-based paint should not be painted with a latex paint, otherwise the adhesion will not be durable. Primers can be chosen to correspond with the color of the paint.

Primer Application

It is essential that the primers should only be applied to dry and clean surfaces. Primer effect will be improved if the surfaces are smoothed by a sand paper, and dust removed with a damp cloth, before the application of primer. After the primer has been applied, cleaning of the surfaces before application of the finishing coat, will improve the desired effects of paint. After the primer application, surfaces may

be painted after a few days to ensure proper drying of the primer. Since the primer fumes may be toxic, proper ventilation by opening windows and use of fans should be ensured. Use of mask or respirator during priming will be helpful.

Types of Primers

Primers are normally based on oil, latex, and shellac, with each category possessing different ingredient characteristics and applications. The primer categories are:

- a. Oil Based Primer - These are primers that dry slowly and produce volatile organic compounds. Mineral spirits are required for cleaning and thinning purposes. The pores are filled adequately, and a smooth finish is produced. Oil primers are generally used for:
 - On existing paint that has deteriorated due to the development of cracks, or other defects.
 - Wood that is not finished.
 - Wood that has been varnished.
 - Woods that have a tendency to bleed.
 - Eroded wood.
- b. Latex Primer - These are water soluble primers that are dried in a short time, and are gradually becoming popular. Latex primers are extremely suitable for unfinished dry walls since they improve the texture and the shine. They also permit passage of water vapor, due to which these are not expected to peel. They produce a finish that resists cracks, due to which this category is suitable for application on the bare softwoods. Latex primers are used on:
 - Masonry works like concrete blocks or bricks.
 - Galvanized metal that has been cleaned properly.
 - Bare softwoods.
 - Unfinished dry walls.
- c. Shellac Primers - The drying of shellac based primers is fast, and denatured alcohol is used for cleaning and thinning. Their performance is impressive when used to stop stains and prevent bleeding. However, due to their bad smell, these are not easy to use. These primers are normally used for:
 - Plaster, wood, plastic, or when drying is required urgently.
 - Covering rust, smoke, and other marks.

Sealer, also called undercoater is a prep coat that forms a non porous layer when applied to a porous surface. IT is also used to isolate problem spots like knots in wood and areas with mildew discoloration. Sealer products include oil based undercoats, reactive resin and catalytic epoxy. Most sealers have a white pigment (titanium dioxide) that blocks out dark stains and colors. Sealers can also block most common stains and control the growth of mold and mildew. Oil based sealers usually clean up with hot solvents.

When to used sealer

Use a sealer before painting porous surfaces such as these:

- Any unpainted surface, including new plaster, drywall and old woodwork that has been stripped.
- Bare open grained woods such as oak and maple
- Bare woods such as redwood that bleed through or discolor paint.
- Large areas of wallboard joint compound or patching plaster.

- Masonry surfaces like unglazed brick, cinder block and concrete
- Metal surfaces: use an oil based primer sealer with rust inhibitors to prevent corrosion.

Safety Practices in Painting Construction Workplace

Painting is one of the easiest do-it-yourself projects. But it is not without its potential hazards. When painting, you're typically working with toxic chemicals, old paint that may contain lead, power tools, and ladders—all of which increase the possibility of injury.

To ensure that your painting project comes off without mishap, you'll need to mix a few safety guidelines with proper respect for the task and common sense.

Let's start with one of the most serious hazards: lead in paint.

Don't sand or scrape old lead-based paint. Any house painted before 1978 is likely to have coats of lead-based paint. Lead is highly toxic and especially dangerous for children and pregnant women.

Common renovation, repair, and painting activities that disturb lead-based paint (like sanding, cutting, replacing windows, and more) can create hazardous lead dust and chips which can be harmful to adults and children. Home repairs that create even a small amount of lead dust are enough to poison your child and put your family at risk.

Use ladders properly. This is critically important because many accidents and injuries are caused by falls from ladders.

Take advantage of protective gear. When sanding or scraping, wear work gloves, a dust mask, and safety goggles. If you are using any solutions containing chemicals, such as strippers or cleaners, wear safety goggles, rubber gloves, and an approved respirator. Also, wear a respirator if the area being painted cannot be adequately ventilated and work for only short periods.

Don't breathe chemicals. Some paints and painting products contain volatile organic compounds (VOCs) and some do not. Whenever possible, opt for those that don't because their fumes are much safer to breathe. When painting indoors, ventilate the area to be painted, opening all doors and windows and using fans. Do not let a freshly painted room be occupied, particularly by older people, children, and pets.

Beware of chemicals and poisons. Clean up carefully and thoroughly when you are done for the day. Don't leave materials, tools, ladders, or rags in work areas that are accessible to children or pets.

Avoid fire hazards. Do not paint or store solvent-based paint, thinners, or strippers near any heat source such as a water heater or fireplace. Never smoke while painting. Don't use a heat gun indoors. If you use one outdoors, be sure you have a fire extinguisher handy.

If rags have alkyd paint or thinner on them, leave them to dry outside on a non-combustible surface to avoid any chance of spontaneous combustion. Choose an area inaccessible to children and pets, and when they are thoroughly dry, take them to a toxic-waste dump site.

Protect floors with plastic sheathing, but cover the plastic with cloth drop cloths so the floors don't become slippery.

Use tools safely. Preparation and painting calls for sharp tools and power tools. Be sure to follow all manufacturer's recommendations—and your own common sense—when using these. Don't put tools on top of a ladder. And keep them out of the reach of children.

PAINTING DEFECTS



BLEEDING: It's a disruption and staining of the painted surface by chemical action. It happens when an incorrect paint is applied over another such as a bituminous one. The remedy is to remove the old paint and renew with a like one.



BLISTERING: It is a common failure caused by poor adhesion or by moisture pushing off the paint. It is prevented by having a dry background , proper pruning and removal of very resinous knots.



BLOOMING: It is the mistiness which can appear on varnished or highly glossed surfaces. It is due to the presence of moisture, draughts or frost during application or condensation on newly painted areas. Remedy is to repaint.



BRUSH MARKS: These may be due to the paint being too stiff, by poor workmanship or by brushing over paint which has partially set. They are removed by rubbing down with waterproof abrasive followed by repainting.

CHALKING: It is the powdering of a paint film usually on exposed outside surfaces. It is a sign that repainting is necessary and may be due to poor quality paint.



CISSING: It is the shrinking of a paint film usually in quite small, but sometimes large areas. It is often due to a greasy undercoat or lack of key between coats. Repainting is the cure.

CRACKING: It starts as fine hair cracks and may turn to flaking. It can be due to lack of elasticity in the finishing coat or. Unequal elasticity between coats of a paint containing excessive driers. Remedy is to repaint.

CRINKLING: It is due to incorrect application and excess of paint which forms “runs” on the surface. Remedy is to rub down and start again.



FLAKING: It is due to poor adhesion or presence of moisture during painting or Due to inadequate cleaning and preparation. Remedy is the defective areas must be redone.

PAINTING PLASTERED SURFACES

Painting a New Surface



The operations are as follows:

Surface Preparation Paint cannot take care of construction defects. Before applying the paint it is ensured that the surface is free from dust, dirt, loose matter, grease etc. and is rubbed with an emery paper, to provide a mechanical key between surface and paint for satisfactory adhesion.

Sequence of Painting The primer (first coat) is applied with brush or spray on the

prepared surface. It should be thinned with water or thinner in the recommended manner and proportion before application. After drying it is rubbed with emery paper.

Dents and cracks, if any, are filled with putty using a knife applicator. Putty should not be applied thick. If the required thickness is large, it should be applied in two coats. After the putty has dried, the whole surface is rubbed down well in order to smoothen the putty and provide a mechanical key to the finished coats.

Two or three finish coats are applied. Each coat is allowed to dry before the application of the next coat.

Painting Old Surfaces

The procedure depends on the state of the existing coating. If any of the defects discussed below is very much pronounced it is completely removed and the surface is painted as a new surface.

Chalking Clean the surface, rub with an emery paper so that the chalk is removed. Apply one or two finish coats.

Efflorescence, Blistering, Cracking and Flaking Scrap off the old paint from affected areas. Touch up with a primer and apply one or two finish coats on affected areas. Rub the entire surface and apply the finish coats.

Glossy surface Remove all gloss by rubbing with emery paper and then apply the finish coats.

Fungus growth Remove the fungus. Apply fungicidal solutions liberally and observe for further growth. If no further growth of fungus is observed apply the desired paint.

PAINTING WOOD SURFACES



Painting of wood work should be done with great care. Normally 3–4 coats are sufficient for wood work.

New Wood Work

Surface Preparation The wood should be well seasoned, dried, cleaned and the surface made smooth with an emery paper. Nails, if any, should be driven down the surface by at least 3 mm.

Knotting Knots in the wood create lot of problems. These excrete resin which causes defects such as cracking, peeling and brown discolouration. Knotting is done so that resin cannot exude from the knots. Any of the following methods may be used suitably.

Ordinary Knotting This is also known as size knotting. The knot is treated with a coat of hot red lead ground with a strong glue size in water. Then a coat of red lead ground in boiled linseed oil is applied.

Lime Knotting The knot is covered with hot lime for 24 hours after which it is scrapped off. Thereafter, the process described in ordinary knotting is followed.

Patent Knotting Two coats of varnish or shellac are applied.

Priming Coat The main function of priming coat or primer is to form the base for subsequent ones. After knotting, a priming coat is applied over the entire surface to fill all the pores. A second priming coat is applied after first has dried. In general the ingredients are the same as those of the subsequent coats but with a difference in proportion.

Stopping After the priming coat putty is applied to fill the pores of the surface. Then it is rubbed smooth. Colouring pigment is also added to it to match the shade of the finished coat. On drying, the selected paint is applied with brushes to bring smoothness and uniformity in colour. After painting the surface in one direction, the brush is worked in the perpendicular direction to eliminate brush marks. This is known as crossing. All the successive coats are applied after drying and slight rubbing of previous coats for proper bond.

Old Wood Work

The old paint is removed with a sharp glass piece, sand paper, paint remover or with a blow lamp. Any smoky or greasy substance should be washed with lime and subsequently rubbed with pumice stone. The surface is then washed with soap and water and dried completely. Then two coats of paints are applied in a way similar to that described in painting new surfaces.

Paints for Wood Work

A mixed pigment paint provides better protection; white lead combined with zinc oxide and a moderate amount of filler such as barytes or silica gives good results. Tinted paints have proved to be satisfactory for maintaining colour and durability. Generally enamel paints are used to give high gloss surface. When the wood is of superior quality and if the grains are to be highlighted the only choice is the varnish forming a transparent or translucent film.

PAINTING METAL SURFACES



a smooth fine surface.

New Iron Work

The surface should be free from scales, rust and grease. Scales and rust are cleaned by hard wire brush. Grease is removed by using petroleum or by hot alkaline solution of Na_2CO_3 or NaOH , benzene, and lime water. A priming coat of red lead with barytes and raw linseed oil is then applied over the prepared surface. After drying of the priming coat, one or more undercoats with desired paint are applied. The second coat is given only after the first coat has dried. The finishing coat is applied carefully to produce

Old Iron Work

The surface is prepared by scraping properly all the scales and rust with emery paper. The greasy substances are removed with lime water. The old paint may be burned with a blow lamp or by suitable solvents. After this the surface is brushed with hot linseed oil and painted as for new iron work.

Paints for Structural Steel Work

The major problem to overcome in painting iron and steel is corrosion due to electrolysis caused by the presence of air and moisture. Red lead is considered to be the best priming coat; it produces a tough elastic film, impervious to air and moisture. Pure linseed oil priming coats are detrimental in that it stimulates corrosion. The linseed oil film is rendered more impervious by the use of spar varnish. Graphite paint used for black colour, is very durable and is not affected by sulphur films, ammonia or chlorine gases. Silica-graphite paints are best; they do not crack and blister in course of time. Aluminium paint is also gaining popularity because of its shining and contrast properties and heat and chemical resistance. Bituminous paints may be very well adapted to paint inside of pipes, iron under waters, piles, ships and boats; they are unsatisfactory when exposed to sunlight. Lead or zinc paint should never be applied directly over the iron surface as it encourages galvanic action destroying the paint.