

Paint 201: Practical Solutions and Problem-Solving Techniques

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Paint 201: Practical Solutions and Problem-Solving Techniques

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Description: Provides an overview of the classification of paints, advantages and disadvantages of latex versus alkyd coatings, surface preparation and priming techniques, and causes and solutions for common paint problems.

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Learning Objectives

At the end of this program, participants will be able to:

- classify paints based on their resin types and curing mechanisms and explain how temperature, air movement, relative humidity, and dew point affect the curing process
- list the physical and environmental properties of latex and alkyd coatings in terms of their advantages and disadvantages and specify the appropriate paint accordingly
- explain the different types of preparation and priming techniques required for various substrates in order to prevent premature coating failure
- discuss three reasons why people paint and determine paint color and finish based on project requirements and creating an aesthetically pleasing and comfortable environment for the client, and
- identify causes of common paint failures such as blistering and mold, and implement solutions to correct current problems and prevent future issues that could lead to health and safety concerns.

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Classifying Paints

Classifying Paints

Introduction

- Different types of paints are typically classified according to the type of resin they contain, or the mechanism by which they dry and cure.
- Oil/alkyd paints and latex/acrylic paints are the most common types of paints sold in the market today.
- Knowledge of the type of coating resin and the method by which it dries and cures will allow problems to be solved before they occur.



Classifying Paints

How to Classify Paints

Paints can be classified according to type of resin or curing mechanism:

- Resin Type: The resin is the glue that holds the pigment in suspension and gives the coating its particular performance characteristics.

- Curing Mechanism: The curing mechanism determines drying time. The time it takes a solvent to evaporate from the coating and how the coating will reach its optimum hardness.



Classifying Paints

Resin Types

There are several different resin types with different coating characteristics:

- Oils / Alkyds
- Latex / Acrylics
- Epoxies
- Urethanes

Each type of resin has its own unique advantages and disadvantages.



Classifying Paints

Curing Mechanisms

Different types of coatings will dry and cure via different curing mechanisms:

- Solvent Evaporation: Solvents are substances that are capable of dissolving other substances. The evaporation of a solvent within a paint is what allows it to dry. Both oil and latex paints dry through solvent evaporation.

- Coalescence: This is the process by which latex paints cure. During solvent evaporation, particles of pigment and binder fuse together with great force, causing them to bind the pigment into a continuous, dry film.

- Oxidation: This is the process by which oil paints cure. The solvent evaporates from the paint leaving the binder and pigment on the surface. The binder then dries, or "oxidizes" as it reacts with the oxygen in the air.

Classifying Paints

Drying vs. Curing

- When discussing curing mechanisms, it is important to distinguish between drying, which occurs first, and curing, which occurs after a period of time.
- Drying occurs when the solvent has evaporated from the coating. Curing occurs when the coating has reached optimum hardness and resistance.
- Oil paints typically dry within 4 to 8 hours and cure within 10 days. Latex paints typically dry within 2 to 4 hours and cure within 30 days.



Classifying Paints

Factors Affecting Curing

Whether working with oil paints or latex paints, curing will be affected by:

- Temperature
- Air Movement
- Relative Humidity
- Dew Point

Together, these four factors influence the choice between oil or latex paint.

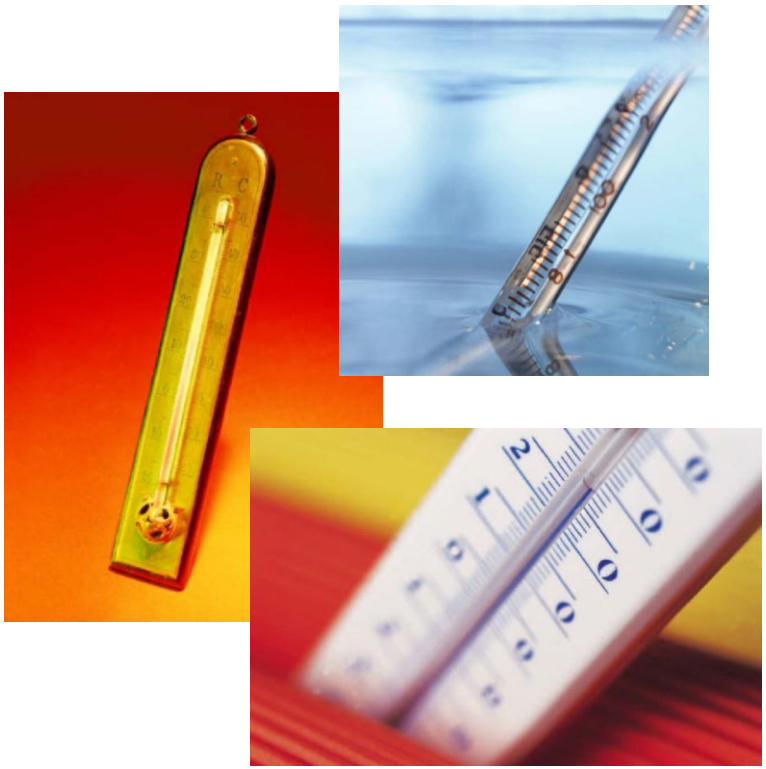


Classifying Paints

Factors Affecting Curing Cont'd…

- Temperature: With oil paints, high temperatures lower viscosity and low temperatures increase viscosity. With latex, high temperatures interfere with bonding and low temperatures tend to inhibit coalescence.

- Air Movement: With oils, increased air movement will shorten drying time and remove odors more quickly. With latex, too much air movement may result in flash drying of the surface and cause the paint to crater.



Classifying Paints

Factors Affecting Curing Cont'd…

- Relative Humidity: For oils, high humidity may lower the appearance of the gloss and shift the color. High humidity may slow the drying time of latex paints, while low humidity may cause poor surface adhesion.

- Dew Point: If the temperature of the air is lower than the dew point of the substrate, the presence of moisture will affect adhesion, drying time, color, and gloss. This is true for both oil paints and latex paints.





Oil and Latex Paints

Oil and Latex Paints

Introduction

- The choice of oil paint versus latex paint for a particular coating job will be dependent on the particular needs of the client or application.
- For example, oil paint, which covers more thoroughly in one coat and is extremely durable, may be more suitable for commercial applications.
- In contrast, latex paint, which is non-yellowing, has low odor, and is easily cleaned up with soap and water, may be more suited to residential uses.



Oil and Latex Paints

Properties of Oil Paints

- The earliest oil-based paints were made using vegetable oil binders, however these paints had several disadvantages, including loss of gloss, fading, and chalking. Today, very few paints are made using oil alone and are instead made using modified oils called alkyds, which dry harder and faster than oils.

- Alkyd resins were first developed in the 1940s by combining oil with alcohol and acid under high temperature and pressure. Even though the vast majority of oil paints used today are technically "alkyds", the terms are used interchangeably.

- One of the disadvantages of oil/alkyd binders is that they will continue to oxidize over time, eventually destroying the resin and causing yellowing and chalking. Because of these limitations, some alkyds have been modified with urethanes and epoxies to provide improved performance characteristics.

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Oil and Latex Paints

Properties of Oil Paints Cont'd…

Advantages	Disadvantages
Wets Surface	Becomes Brittle
Surface Tolerant	Chalks With Age
Abrasion Resistance	Tends to Yellow
Holds Sharp Edge	Slow Drying
Cures Quickly	

Oil and Latex Paints

Properties of Latex Paints

- Latex paints consist of a water-based liquid combined with a plastic-like latex binder. Once latex paints are applied to a surface, the coating retains microscopic pores that allow it to "breathe", resulting in a paint that is more tolerant to moisture and blistering than other types of paints.

- The properties that provide latex paints with advantages over oil/alkyd paints can, in some cases, also result in a disadvantage. For example, the flexibility of latex paints results in a corresponding decrease in abrasion resistance.

- Nonetheless, latex paints do provide several important advantages over oil/ alkyd paints, including superior color retention and gloss retention, resistance to yellowing over time, and easy clean up. Given today's focus on environmental issues, the low VOC emissions of latex paints are an especially desirable feature.

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Oil and Latex Paints

Properties of Latex Paints Cont'd…

Advantages	Disadvantages
Color Retention	Creates Surface Tension when Drying and Curing
Gloss Retention	Freezes
Dries Quickly	Less Abrasion Resistant
Low odors	Less Temperature Tolerant
Flexible	Cures Slowly
Blister Resistant	
Easy Clean-Up	
Non-Yellowing	



Surface Preparation and Primers

Surface Preparation and Primers

Introduction

- With any coatings project, adequate and proper surface preparation is crucial to the successful completion of the work.
- Proper preparation and priming are critical in preventing the premature failure of any type of coating.
- Proper surface preparation and priming are particularly important when dealing with wood, masonry, and metal substrates.



Surface Preparation and Primers

Painting Wood

- When painting wood, it is essential that a protective coating be applied to the surface prior to painting, regardless of the intended use.
- This protective coating, or primer, should only be applied once the wood is clean, dry, and mildew-free.
- It is also important to ensure that any nail holes or cracks in the wood surface are filled and repaired prior to ensure a smooth finish.



Surface Preparation and Primers

Painting Wood Cont'd…

- The type of wood being painted will affect the painting process. For example, Southern Yellow Pine may have knots that will produce sap.
- As a result, any knots should be sealed with a fast-drying oil/alky primer prior to painting.
- Redwood and cedar are both rich in tannins, which may bleed through the finish coat unless they are sealed with an oil-based primer.



Surface Preparation and Primers

Staining Wood

- When staining, the wood surface should be clean and dry. Pressure-treated wood in particular must be allowed to dry prior to painting.
- If steel nails are present in the wood, they should be set below the surface and the holes should be filled in.
- Loose fibers should be removed with a stiff brush and any chlorides that may migrate to the surface during drying must also be removed.



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Surface Preparation and Primers

Re-Staining Wood

- Wood that has aged and needs to be re-stained should be stripped of all of the old finish and treated as if it were a new wood surface.
- It may be necessary to use a wood bleach system in order to ensure that an even color is achieved.
- Outdoor wood surfaces that are to receive a clear finish will require a minimum of four coats of a finish specifically designed for exterior use.



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Surface Preparation and Primers

Painting Masonry

- When painting masonry surfaces, such as precast concrete, cinder block, or stucco, it is important to consider surface porosity and pH.
- Cinder block, for instance, has a highly porous surface and must be adequately filled prior to painting.
- In terms of surface pH, concrete should not exceed 9 or 10 after 30 days of curing. Painting over "hot" masonry will "burn" the resin.



Surface Preparation and Primers

Painting Metal

- When painting galvanized steel or non-ferrous metal surfaces, latex or waterborne acrylic paints should be used to prevent saponification.
- Aluminum will receive any type of paint as long as the surface is properly cleaned and prepared.
- Any shipping coats of oil or paraffin that have not weathered away after a period of about six months should be removed using a solvent wash.





Finish Coats

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Finish Coats

Introduction

- The three main reasons that people paint are to provide color, to provide sheen, and to provide protection from the surrounding environment.
- Understanding the relationships between colors helps to create harmonious work or living spaces.
- The type of finish coat should be chosen based on both its aesthetic qualities and its protection and performance characteristics.



Finish Coats

Why do People Paint?

Regardless of the specific type of application, people paint for three main reasons:

- Color: Paint can be used to provide color to a given space. Different color schemes can be used to create a certain appearance or set a mood for a room. Color can also be used for safety, by identifying hazardous areas.

- Sheen: Paint is often used to provide substrates with a sheen that will enhance its appearance, as well as certain performance characteristics, such as durability and washability. Different sheen levels are available for different applications.

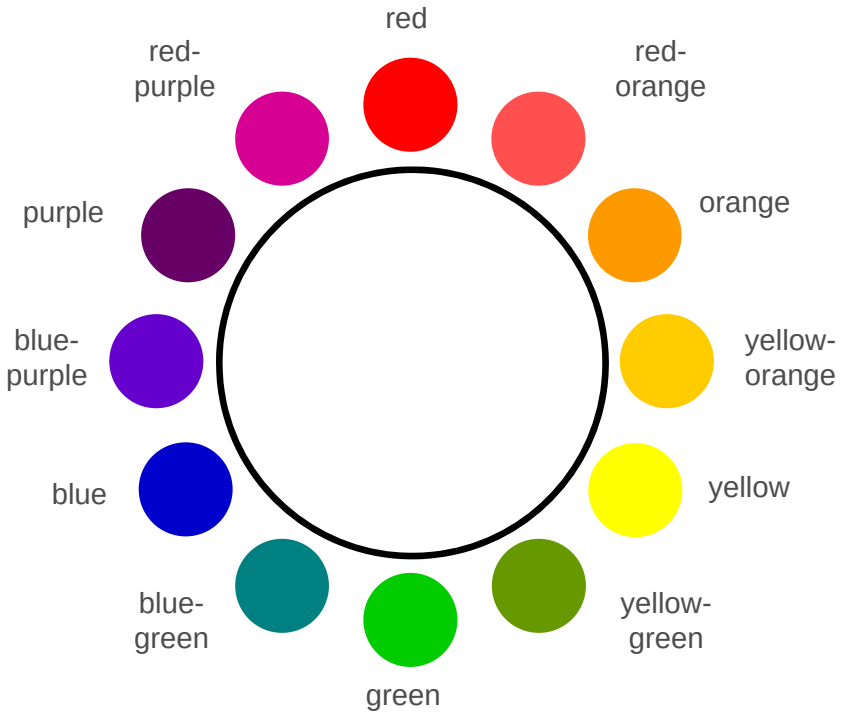
- Protection: Paint helps protect substrates from the environment, such as water and solar energy, from exposure to chemicals (either household and industrial), and from the effects of physical abuse, such as wear and tear, and foot traffic.

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Finish Coats

Color

- Because color affects the appearance of a space and the mood of people in the space, it is often the driving factor behind the selection of paint.
- Color psychology is the study of how colors evoke an emotional response and affect the body and mind.
- Understanding the relationships between colors on the color wheel is critical to one's ability to select an appropriate color scheme for a space.

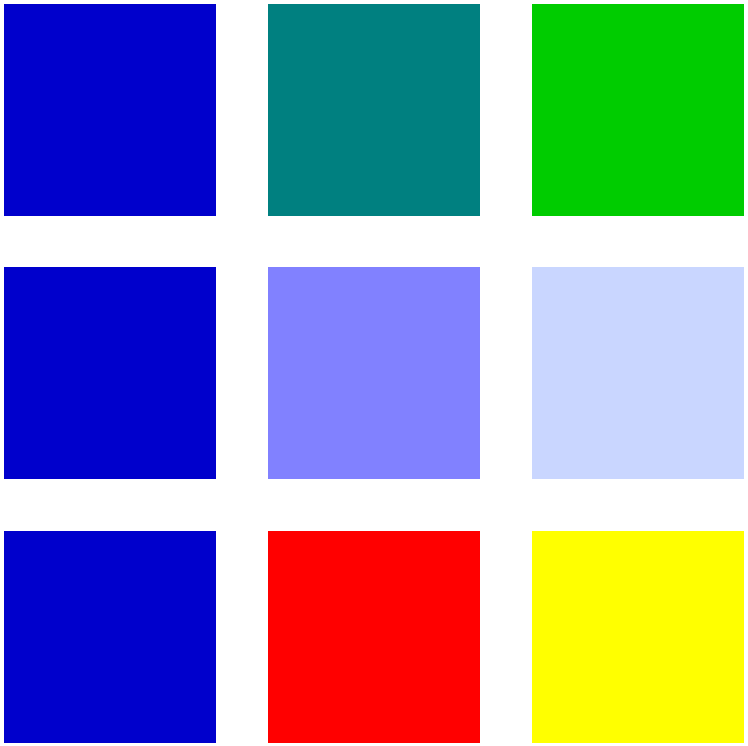


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Finish Coats

Color Schemes

- Analogous: Consist of three colors side by side on the color wheel. These schemes tend to be easy on the eye and often have a very soft feel.
- Monochromatic: Consist of tints and shades of one hue. These schemes are harmonious, quiet, restful, and subtle.
- Triad: Consists of three colors located equidistant from one another on the color wheel. These schemes tend to be strong and stimulating to the eye.



Finish Coats

Sheen

- Sheen levels vary from matte to high-gloss. Different sheen levels have different attributes, which may influence their selection for use.
- In general, glossy coatings are used for extra durability or washability or when needed for aesthetic reasons.
- High gloss coatings will accentuate surface defects, imperfections, and texture. Flat is the most forgiving sheen, while high gloss is the least.



Finish Coats

Sheen Cont'd…

Appearance	Durability
Higher sheens accentuate surface defects, textures, and imperfections	Higher sheens are generally more durable due to their higher resin content
Flat hides surface defects and is the most forgiving sheen	Lower sheens are not as durable but are easily cleaned
Lower sheens soften the appearance of a room and make walls look smooth	Glossy finishes provide a smooth luster and are excellent for trim, doors, and furniture

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Finish Coats

Residential Protection

- Residential coatings are designed to provide color and protect interior and exterior substrates under a wide variety of circumstances.
- For interior surfaces, such as plaster and drywall, paint can be used to provide durability and washability.
- For exterior surfaces, such as wood decking and siding, paint can be used to provide protection from exposure to the sun and wind-driven rain.



Finish Coats

Commercial Protection

- Commercial coatings are designed primarily to protect surfaces and provide greater chemical resistance and improved abuse resistance.
- Coatings are often an important component of facilities maintenance in commercial applications.
- Two-component coatings are often used in commercial settings because they provide enhanced chemical resistance and abrasion resistance.



Finish Coats

Specialty Protection

- There are a variety of specialty paint products that are formulated specifically for use by professionals in commercial or industrial settings.
- These coatings may be designed to be fast-drying, suitable for spray application, or easily touched up.
- Other types of specialty coatings may be designed to provide low odor, low VOC emissions, extreme durability, and added splatter resistance.





Problem Solving

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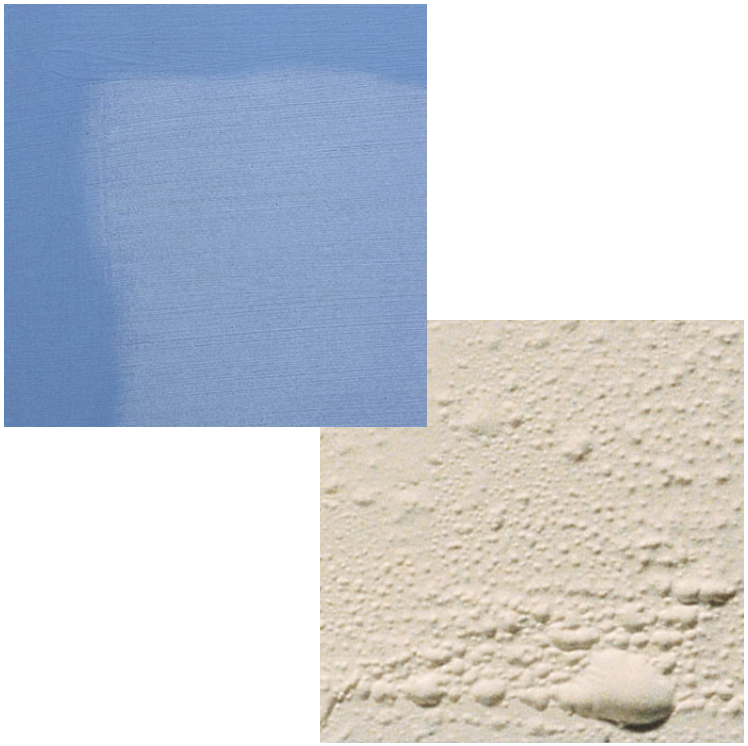
Problem Solving

Introduction

Several problems may occur before, during, or after paint application:

- Blocking and Yellowing
- Lapping and Hatbanding
- Sagging and Blistering
- Chalking and Mildew
- Cracking and Flaking
- Tannin Staining
- Surfactant Leaching

Each of the above problems will affect the appearance of the finish coat.



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Problem Solving

Blocking

- Blocking occurs when two painted surfaces become stuck together. For example, a door stuck to a door jamb, or window stuck to a window sill.
- The most common causes of blocking are insufficient drying time before closing doors or windows and use of low quality semi-gloss or gloss paints.
- High-quality latex paints offer superior blocking resistance to low-quality latex paints, especially under warm, humid, and damp conditions.



Problem Solving

Yellowing

- Aging oil or alkyd paints may yellow over time due to the continuing process of oxidation that takes place throughout the life of the coating.
- Yellowing can be caused by exposure to heat sources and is most visible with white paint or clear varnish.
- Because latex paints dry through a process of coalescence as opposed to oxidation, the use of a high-quality latex will help minimize yellowing.



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Problem Solving

Lapping

- Lapping refers to a non-uniform appearance where a denser color or increased gloss is visible where wet and dry layers have overlapped.
- This may be caused by the use of a low-quality paint or the failure to maintain a "wet edge" during application.
- In order to maintain a "wet edge", apply paint over a manageable area, toward the unpainted area and back into the just painted surface.



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Problem Solving

Hatbanding

- Like lapping, hatbanding involves a non-uniform finish that is caused by excessive cutting-in of the walls, trim, corners, and ceiling with a brush.
- It may also be caused by rolling walls with an excessively long-nap roller or applying a wet finish to dry areas.
- When cutting-in, it is important to feather the edge to produce a coat with similar thickness to the coat that will be later applied with a roller.



Problem Solving

Sagging

- Sagging refers to the downward dripping of the paint film that takes place immediately after application and results in an uneven coating.
- Sagging may be caused by applying paint too heavily, over-thinning paint, or painting in excessively humid or cool conditions.
- Sagging should be immediately re-rolled or brushed out to redistribute the excess evenly. If the paint has dried, sand and reapply a new coat.



Problem Solving

Blistering

- Blistering can be caused by excess moisture, a poorly prepared chalked surface, or application of latex paint below minimum temperatures.
- Prior to repainting, blistered paint should be removed with pressurized water and scraped off as required.
- Excess moisture can be minimized by caulking any cracks, holes, and seams, and providing vents, attic louvers, and exhaust fans.



Problem Solving

Chalking

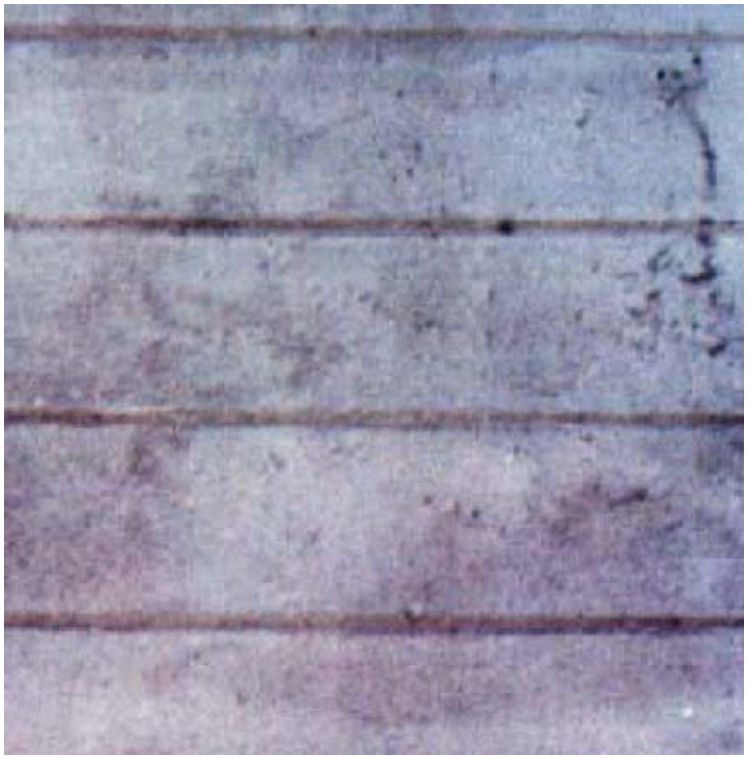
- Some slight chalking of weathered exterior paint is normal however, in some cases, aluminum siding may develop an overly thick chalk layer.
- If new paint is applied over severe chalking, the chalking will cause peeling problems in the new paint .
- Before painting over a chalked surface, it is important to power wash the surface with detergent to ensure complete chalk removal.



Problem Solving

Mildew

- Mildew will tend to form on areas with high humidity, poor ventilation, little or no direct sunlight, or those surfaces that provide a nutrient.
- Use of low-quality paint, with an insufficient amount of mildewcide, also contributes to mildew growth.
- Mildewed areas should be brushed or sprayed with a solution of one part bleach to three parts water and flushed clean prior to repainting.



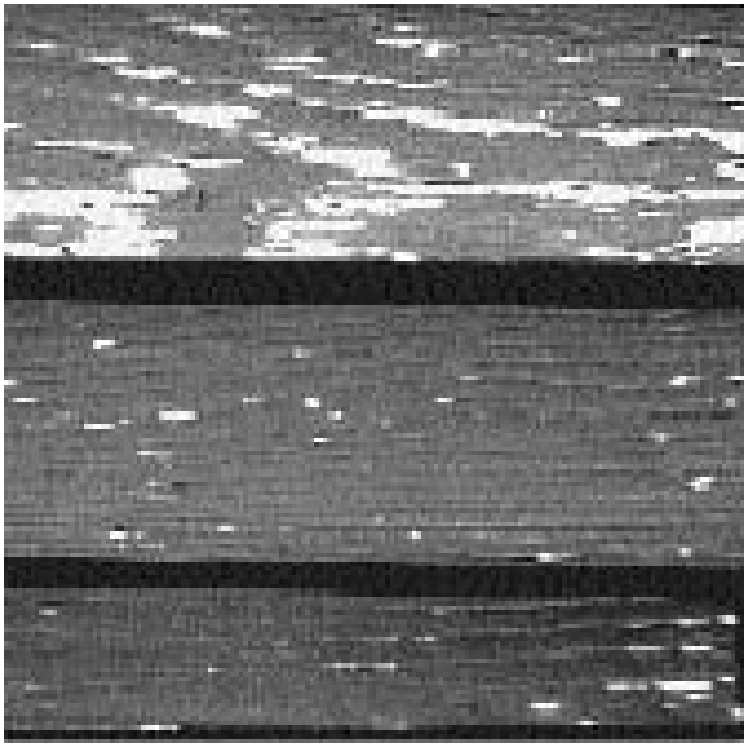
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Problem Solving

Cracking and Flaking

- Flaking, or lifting of paint from the underlying surface, is often preceded by cracking and typically occurs over wood with a non-porous "flat" grain.
- Seasonal weather fluctuations cause wood to expand and contract, which results in cracking and then flaking.
- Wood with cracking or flaking paint should be lightly sanded to reveal a fresh wood surface and coated with a high-quality under-coater or primer.

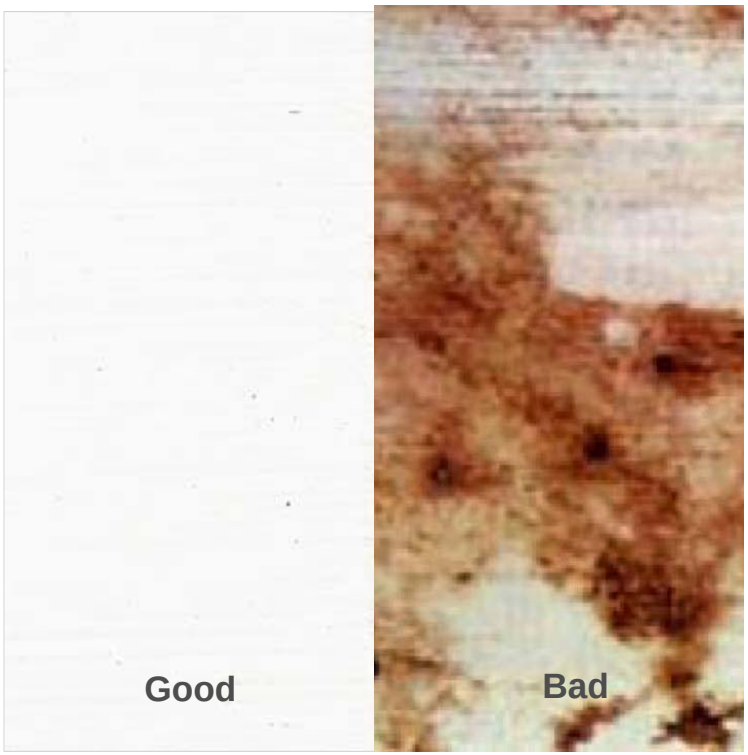


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Problem Solving

Tannin Staining

- Woods, such as cedar, contain natural-colored dyes or tannins, which are water-soluble and can be activated by the application of a paint or stain.
- New red-colored woods must be sealed with a barrier coat in order to prevent staining of the top coat.
- Extreme cases of tannin staining may require the application of one to two coats of an alkyd primer in order to properly seal the wood surface.



Problem Solving

Surfactant Leaching

- All latex paints contain detergent-like materials called surfactants, which are necessary for stability and typically dissipate in small amounts.
- If paint is exposed to moisture or low temperatures during curing, this leaching process may occur quickly and result in surfactant build-up.
- The area should be flushed with water before stains harden. If stains cannot be removed, repainting during more favorable weather may be required.



Problem Solving

Questions to Ask

When there is a problem with a paint application, there are several important questions to ask in order to identify the cause and determine a potential remedy:

- What: It is important to determine the type of product that was used (oil, latex, etc.), the drying method, and the surface preparation that was carried out.
- Where: Another important consideration is the location of the surface. Exterior surfaces are typically exposed to much harsher conditions than interior surfaces.
- When: When the paint was applied and the atmospheric conditions during application can have a large impact on the quality of the finished coating.
- How: It is also important to identify how the paint was applied (brush, roller, etc.) and whether the method of application was appropriate for the type of paint.

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Course Summary

Course Summary

Classifying Paints

- Different types of paints are typically classified according to the type of resin they contain, or the mechanism by which they dry and cure. There are several different resin types available on the market today, including oils/alkyds, latex/ acrylics, epoxies, and urethanes. Oil paints and latex paints are most common.

- Different types of coatings will dry and cure via different curing mechanisms. Both oil and latex paints dry through solvent evaporation. Oil paints cure through oxidation, while latex paints cure through a process of coalescence.

- It is important to distinguish between drying, which occurs over a period of several hours, and curing, which occurs over a period of several days. The curing of oil and latex paints can be affected by a number of different factors, including temperature, air movement, relative humidity, and dew point.

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Course Summary

Oil and Latex Paints

- The choice of oil paint versus latex paint will be dependent on the particular needs of the client or application. For example, oil paint, which is extremely durable, may be more suitable for commercial applications. In contrast, latex paint, which is easily cleaned up may be more suited to residential uses.

- Most oil paints are actually made with alkyd resins, which were first developed by combining oil with alcohol and acid under high temperature and pressure. One disadvantage of oils/alkyds is that they will continue to oxidize over time.

- Latex paints consist of a water-based liquid combined with a latex binder. Although latex paints are less abrasion resistant than oils, they do provide several advantages, including superior color retention and gloss retention, resistance to yellowing over time, easy clean up, and low VOC emissions.

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Course Summary

Surface Preparation and Primers

- With any type of coatings project, whether it involves wood, masonry, or metal substrates, proper surface preparation is crucial to the successful completion of the work. For instance, when painting wood, it is essential to apply a primer to the surface in order to promote adhesion and prevent tannin staining.

- When painting masonry, it is important to consider surface porosity and pH. Cinder block, for instance, is highly porous and must be filled prior to painting. For concrete, the surface pH should not exceed 9 or 10 prior to painting.

- When painting galvanized steel or non-ferrous metal surfaces, latex or water-borne acrylic paints should be used to prevent saponification. Aluminum will receive any type of paint as long as the surface is properly cleaned and prepared. For all metal surfaces, it is important to remove shipping coats of oil or paraffin.

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Course Summary

Finish Coats

- The three main reasons that people paint are to provide color, to provide sheen, and to provide protection. Color is used to create a certain mood or appearance, while sheen is used to provide durability and washability. Paints also help to protect substrates from the environment, chemicals, and wear and tear.

- Because color affects the appearance of a space and its mood, it is often the driving factor behind the selection of paint. Understanding the relationships between colors is critical to the selection of an appropriate color scheme.

- Sheen levels vary from matte to high-gloss. In general, glossy coatings are used for extra durability or washability or when needed for aesthetic reasons. High gloss coatings will tend to accentuate surface defects, imperfections, and textures. Flat is the most forgiving sheen, while high gloss is the least.

Course Summary

Problem Solving

- There are a variety of different problems that may occur before, during, or after paint application, including blocking, yellowing, lapping, hatbanding, sagging, blistering, chalking, mildew, cracking, flaking, tannin staining, and surfactant leaching. Paint problems are typically caused by poor surface preparation.

- Most paint application problems can be solved by determining the type of paint used (oil, alkyd, etc.), where it was applied (interior or exterior), the conditions under which it was applied, and how it was applied (brush, roller, spray etc.).

- For example, blistering is typically caused by the presence of excess moisture or poor preparation of a chalked surface. Once the cause of the blistering has been determined and the paint removed, the problem can be solved by eliminating the source of moisture and applying an appropriate primer to the surface.

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