



# **PAINT TECHNOLOGY:** ***CHEMISTRY AND*** ***PERFORMANCE***

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# PAINT TECHNOLOGY: CHEMISTRY & PERFORMANCE

Course Number EL203A & EL203B

Thursday, June 21, 2018

Friday, June 22, 2018

Learning Units 1.0 LU, HSW, GBCI, RIBA

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Benjamin Moore & Co.

EL203A

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Gary Sweet

Training Implementation Specialist

Benjamin Moore & Co.

EL203B

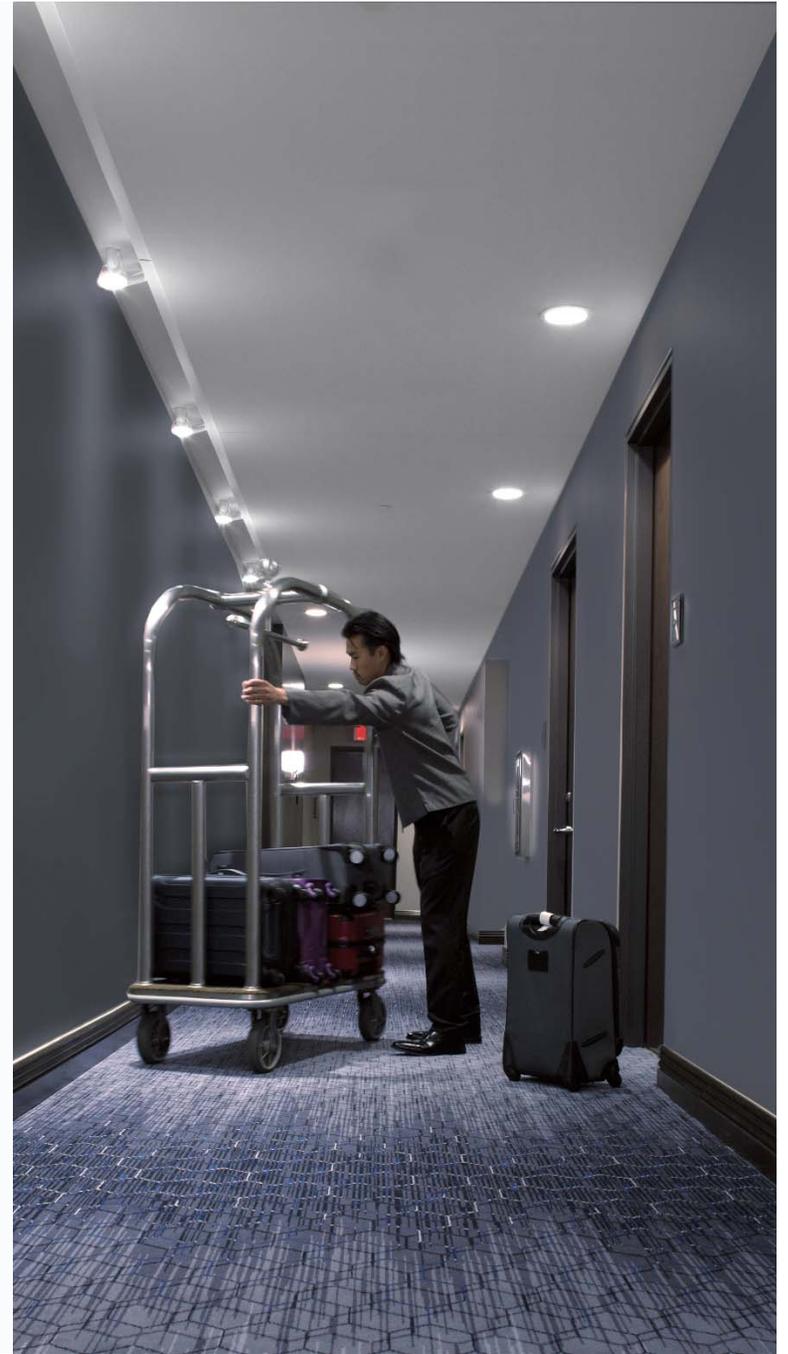
# LEARNING OBJECTIVES

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

- Learn the different functions of the four components of paint and their impact on performance.
- Distinguish among the different aesthetic and functional features of finishes.
- Describe the role of your manufacturer rep in the specification process.
- Discover the benefits of the latest paint technology.

# THE PURPOSE OF COATINGS

- Aesthetic
- Protection



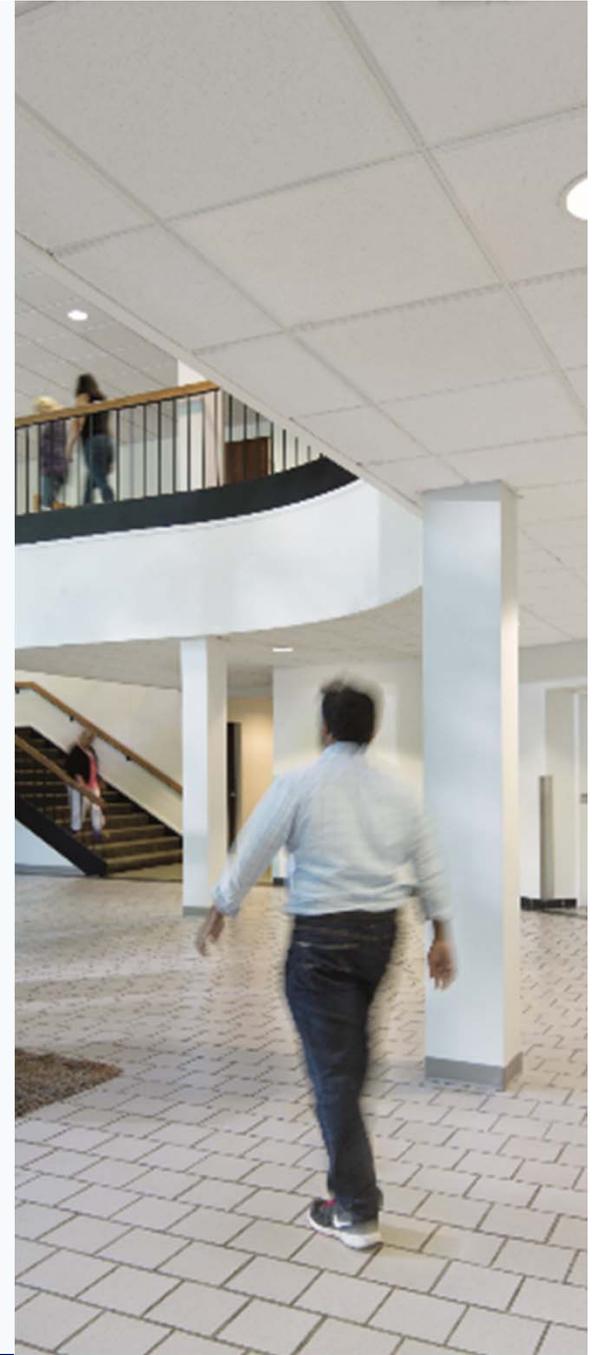
# TYPES OF COATINGS

- Architectural Coatings
- Industrial Coatings
- Special Purpose Coatings



# ARCHITECTURAL COATINGS

- Residential
- Public buildings
- Retail / Hospitality
- Healthcare
- Offices
- Factories



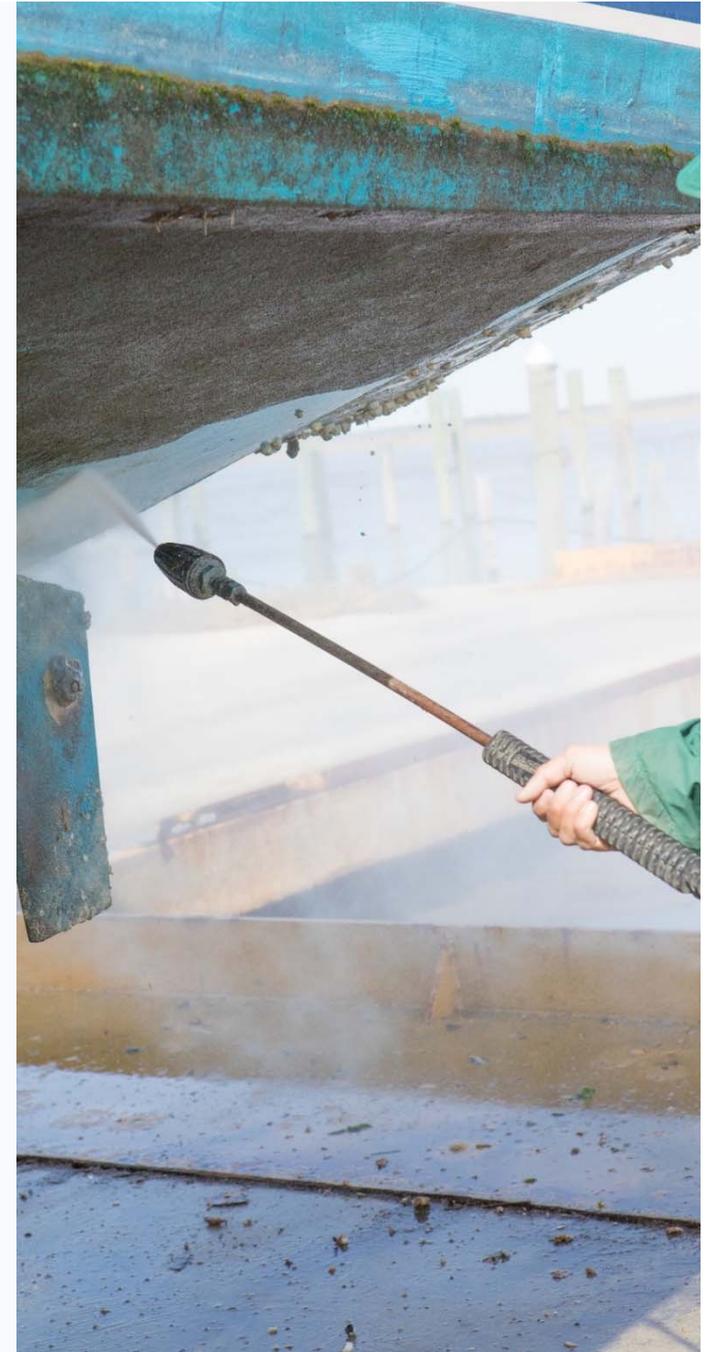
# INDUSTRIAL COATINGS

- Protect surface
  - Extreme conditions
  - Weather
  - Corrosion
  - Chemical Exposure
  - Safety



# SPECIAL PURPOSE COATINGS

- Appliance Coatings
- Metal Food Can Linings
- Electronic Coatings
- Automotive
- Marine
- Traffic Marking Coatings



# PAINT COMPONENTS



# COMPONENTS OF PAINT



# PIGMENTS



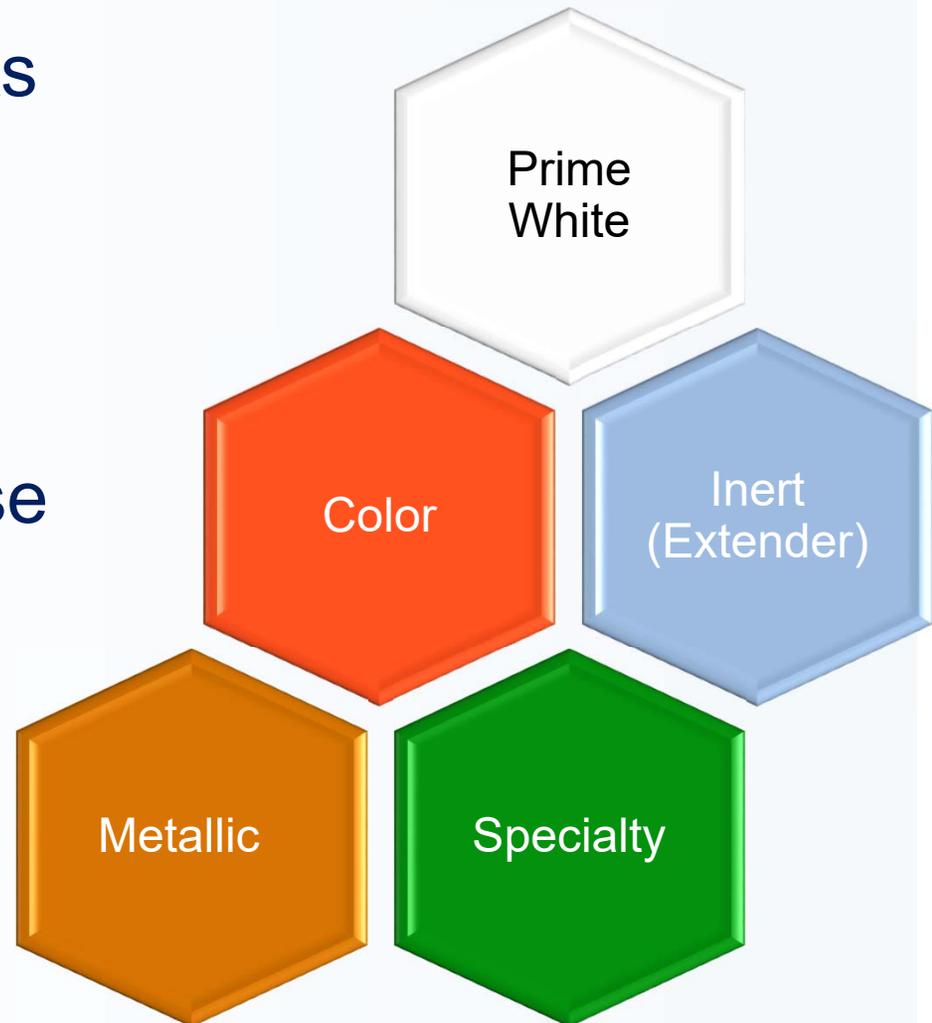
Hide

Color

Protection

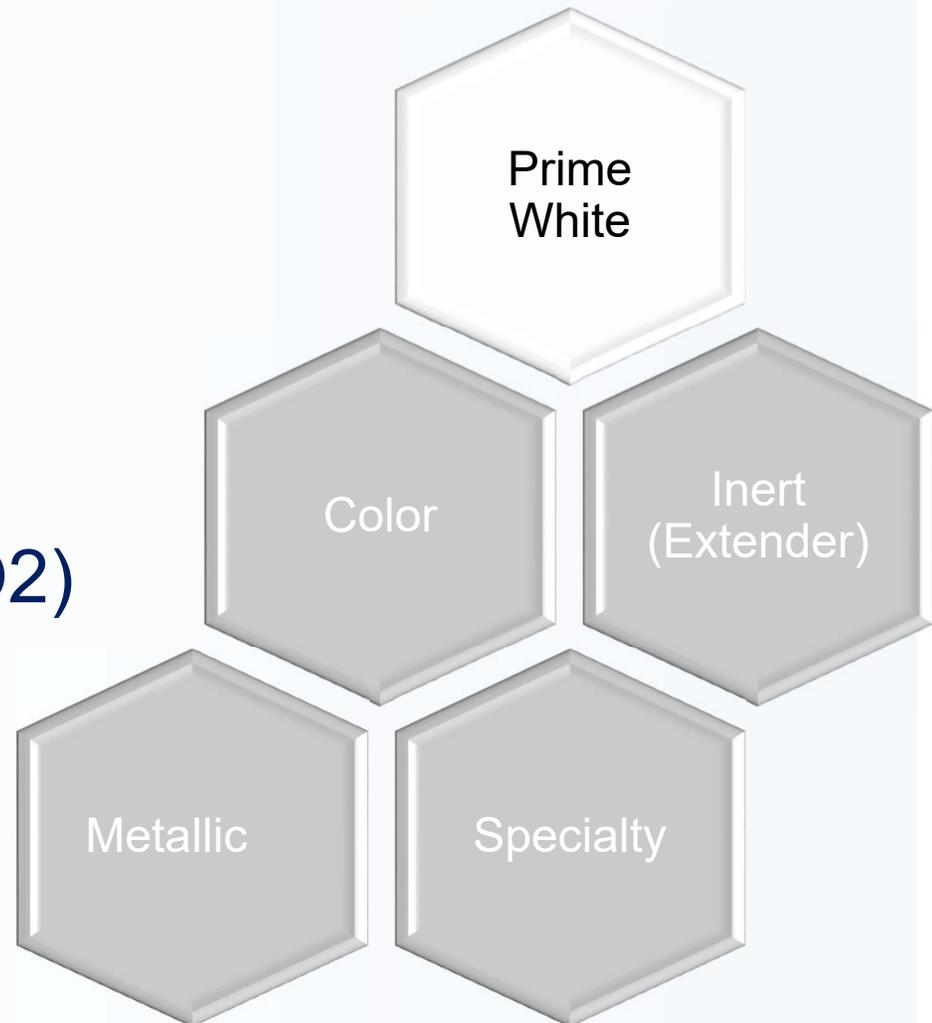
# PIGMENT TYPES

- Five types of pigments
- Unique performance characteristics
- Manufacturer's choose a combination of pigments



# PRIME WHITE

- Whiteness
- Color
- Hide / Opacity
- Titanium Dioxide (TiO<sub>2</sub>)



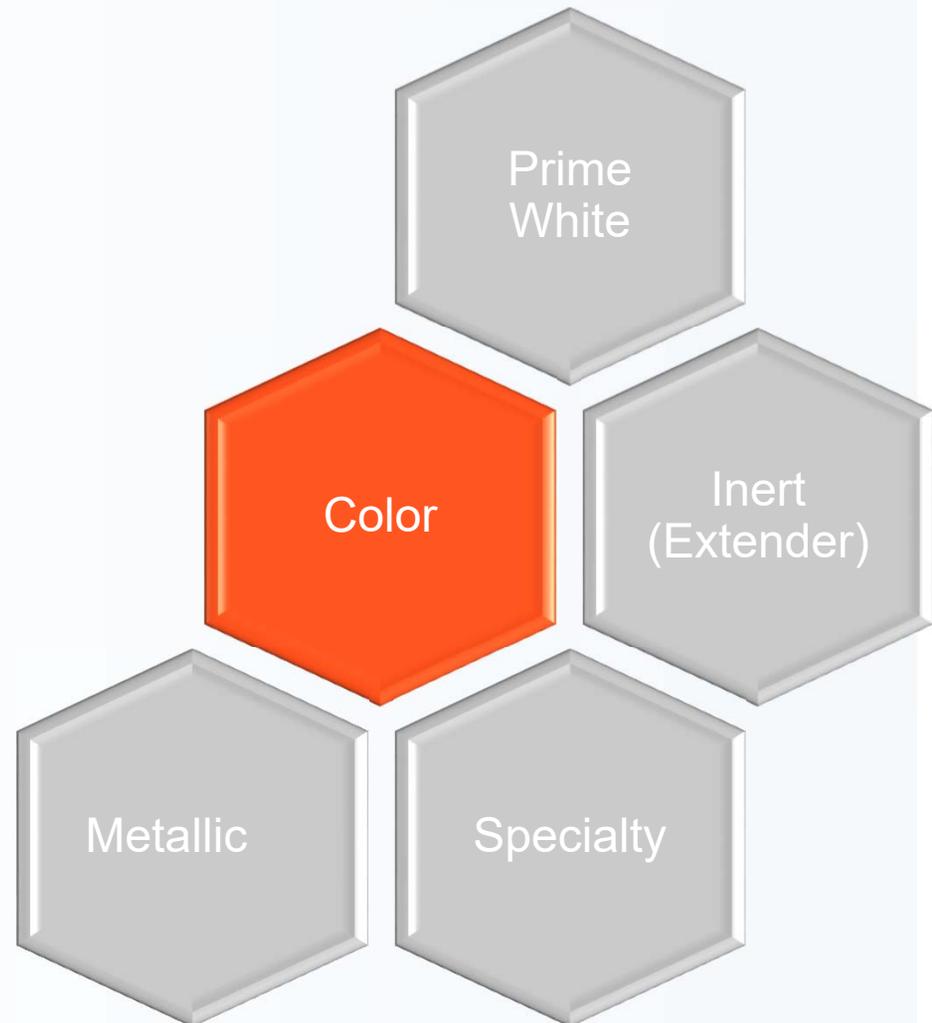
# TITANIUM DIOXIDE

- Widely used pigment
- Whiteness
- Hide (Opacity)
- Resistance to chemicals and ultraviolet light
- Expensive



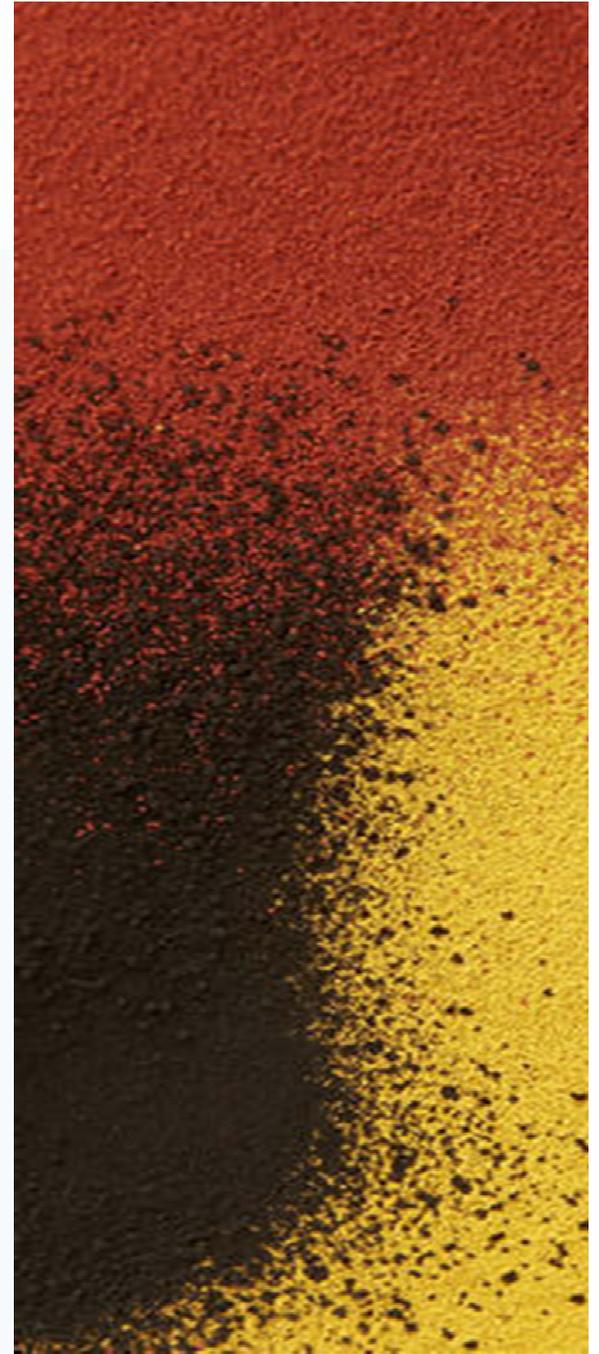
# COLOR

- Organic (Synthetic)
  - Plants, animals, and synthetic sources
- Inorganic (Natural)
  - Insoluble compounds made of minerals and clay



# COLOR PIGMENTS

- Strength, opacity and transparency vary
- Reactive to heat, chemicals and water



# COLORANTS

- Universal Colorants
- Waterborne Colorants
- Industrial Colorants



# UNIVERSAL COLORANTS

- Water-based paints, alkyds and synthetic enamels
- Contain glycols
- VOCs
- Darker colors can add upward of 100 g/L of VOCs to a gallon of paint



# WATERBORNE COLORANTS

- Latex paints and water-based paints
- Manufacturers purchase colorants from third party (low VOC); or
- Manufacturers formulate their own colorants (no added VOCs)



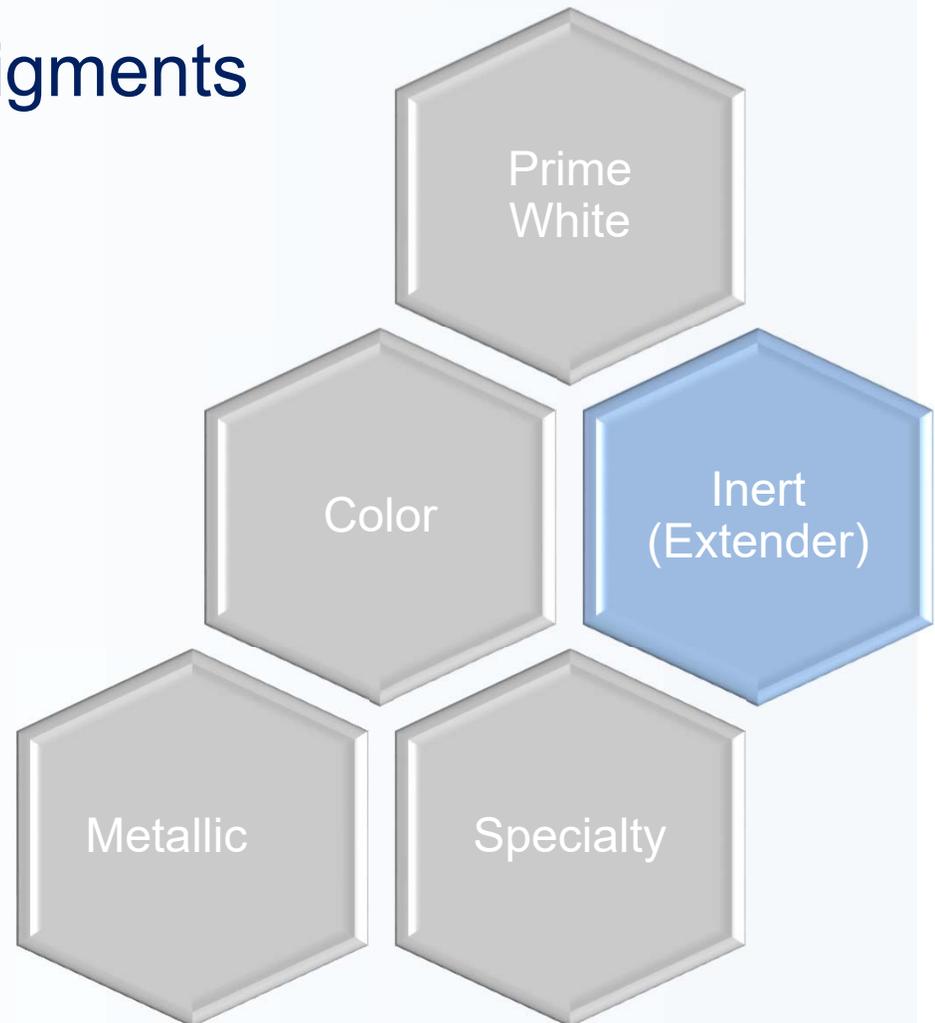
# INDUSTRIAL COLORANTS

- High-performance solvent-based paints
- Contain resin and aromatic solvents
- High VOCs

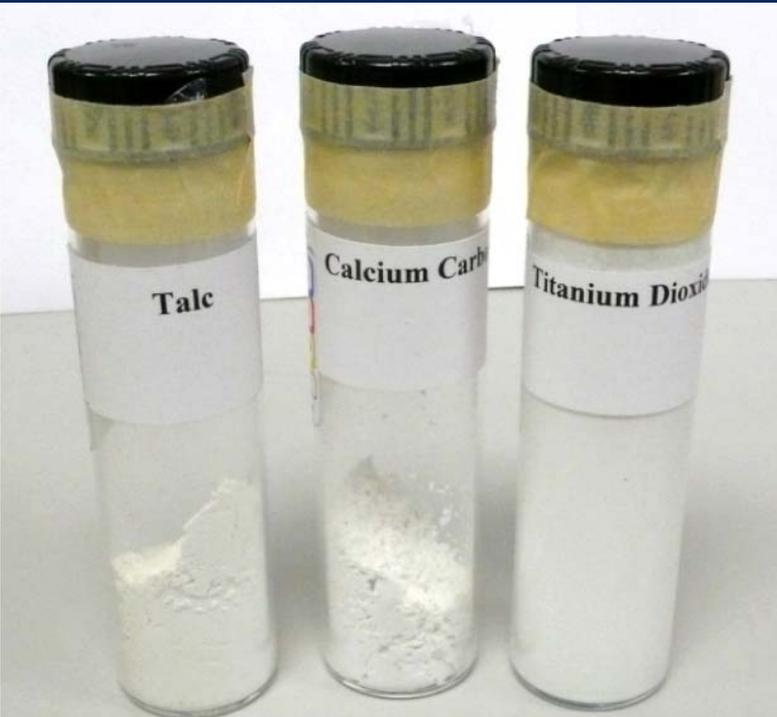


# INERT (EXTENDER)

- Extend prime white pigments
- Durability
- Gloss/Sheen
- Scrubbability

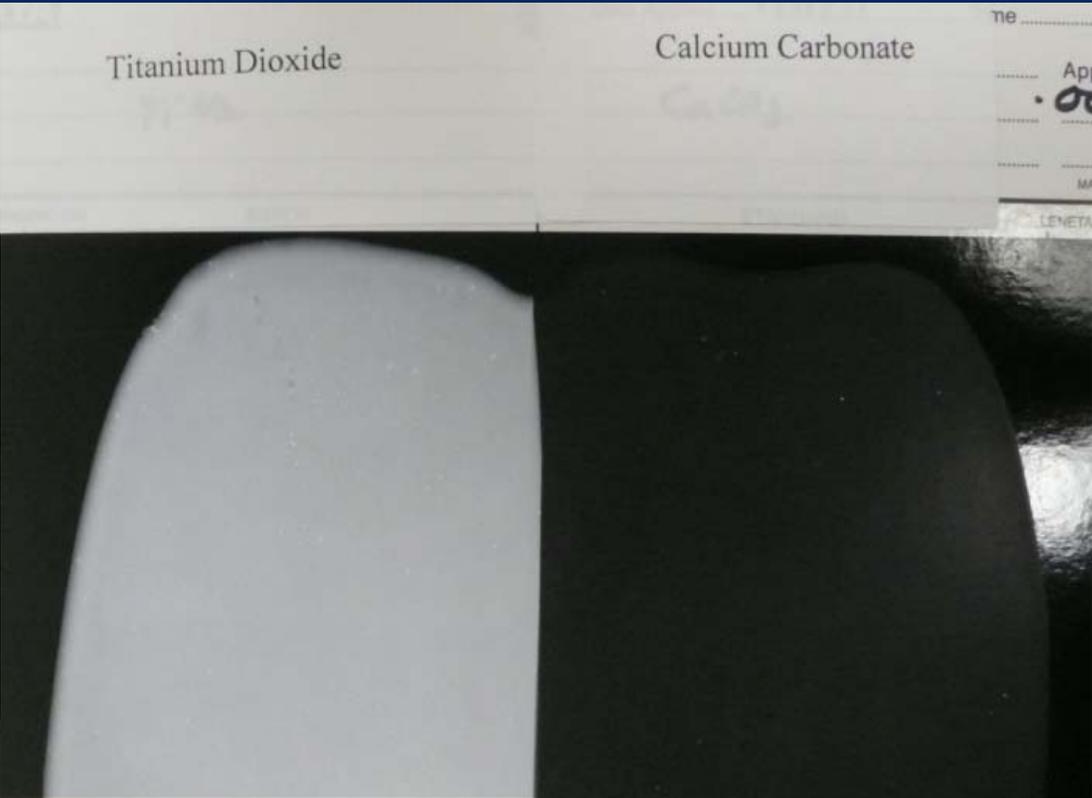


# HIDE / OPACITY



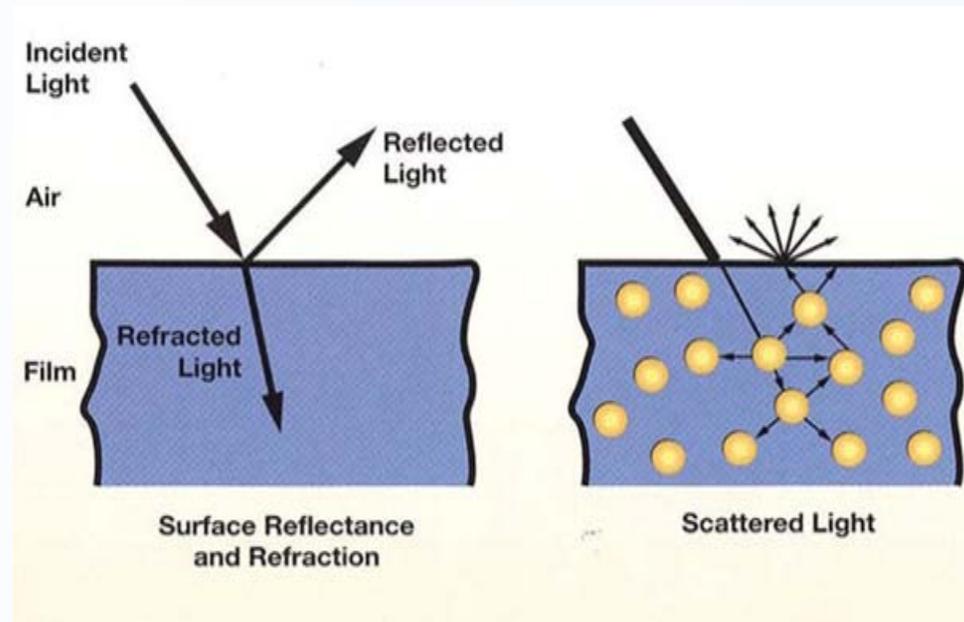
Extender

Primary



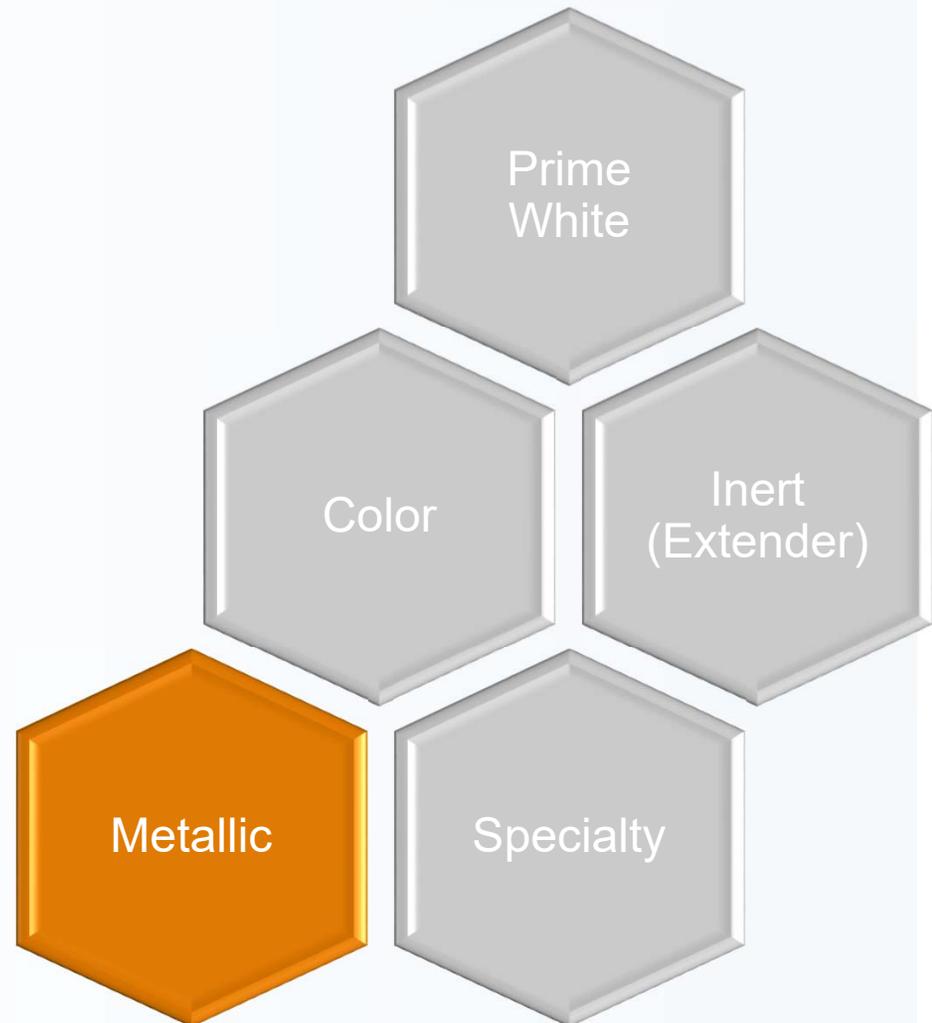
# OPACITY IN PAINT

- Opacity is generated by two mechanisms:
- Light scattering
- Light absorption



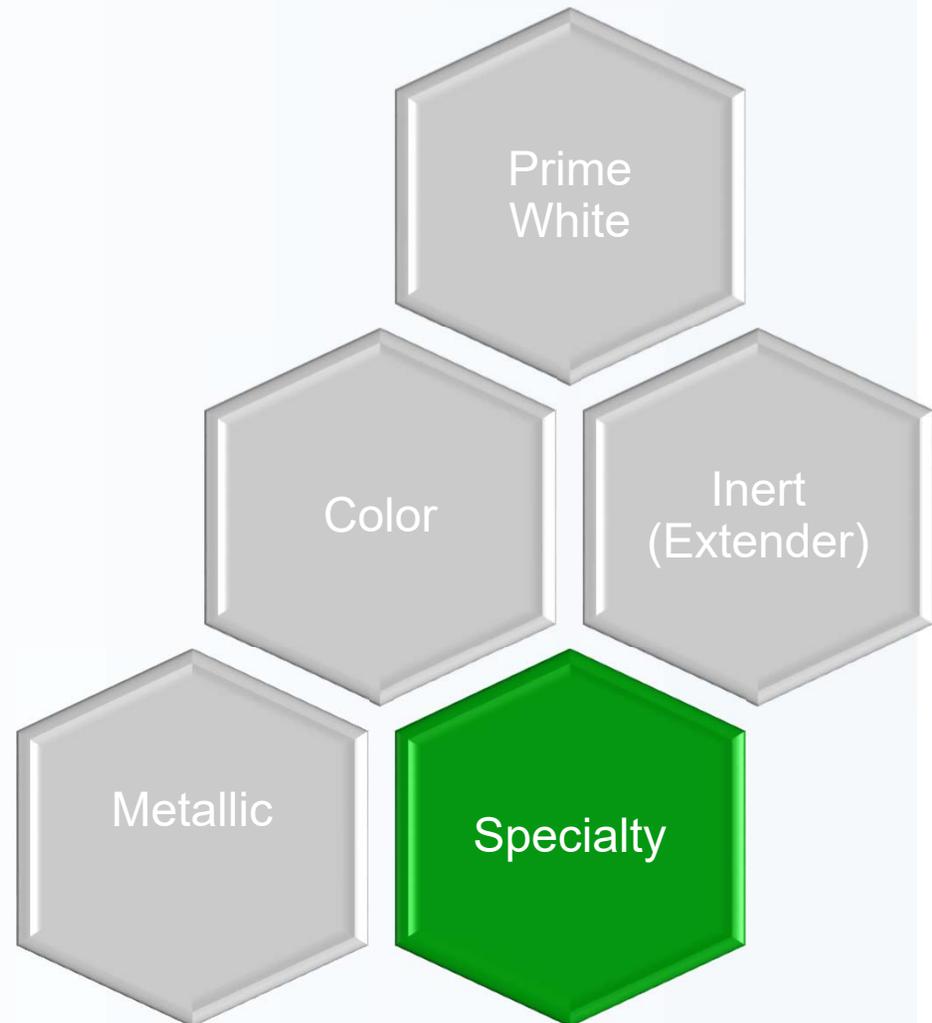
# METALLIC

- Aluminum: Sealing
- Zinc: Anti-corrosive
- Decorative



# SPECIALTY

- Flame Retardant
- Anti-fouling



# RESINS



Holds pigment  
particles together

Paint Film

Adhesion

# TYPES OF RESIN

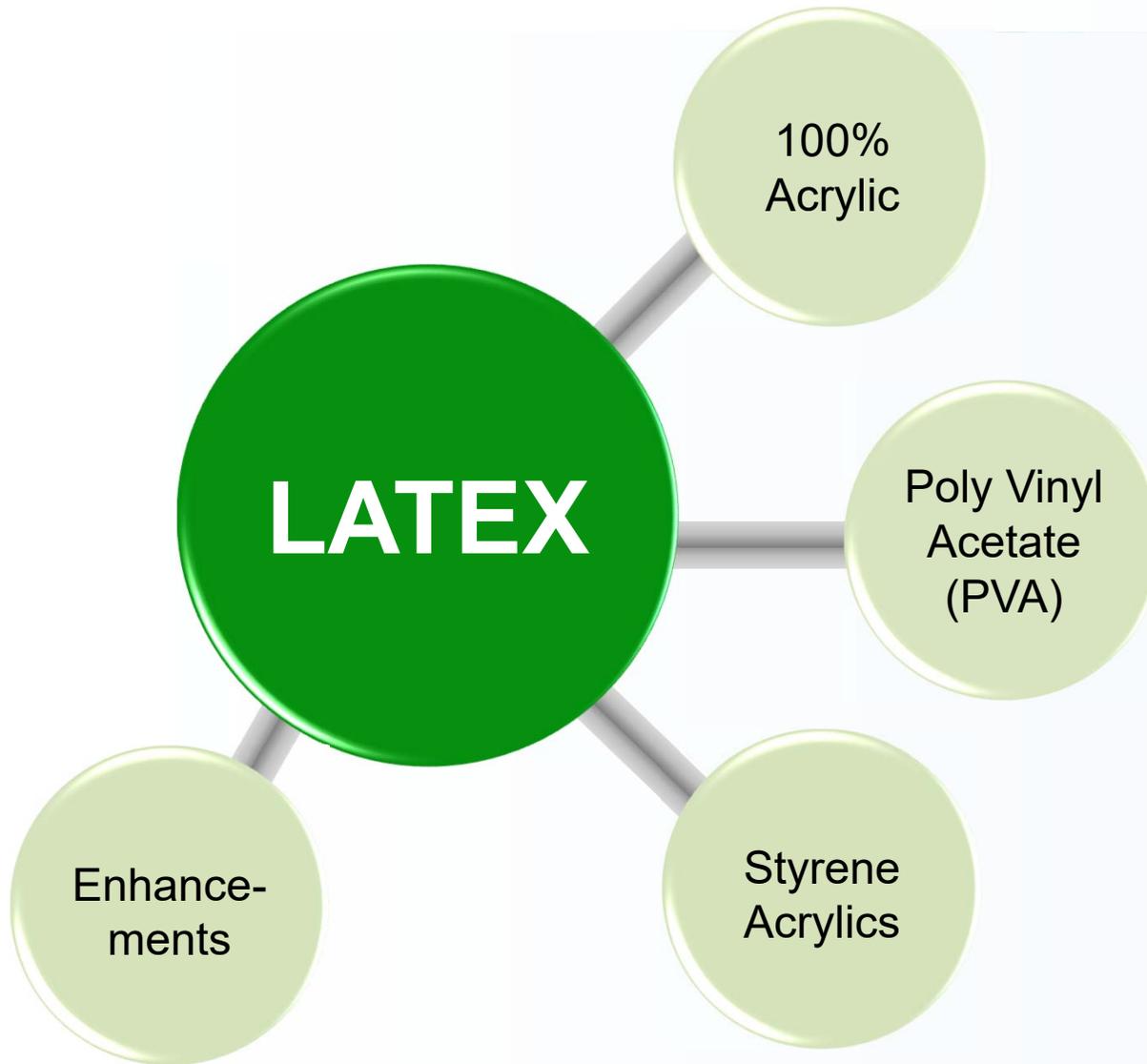


**LATEX**



**ALKYD /  
OIL-  
BASED**

# LATEX



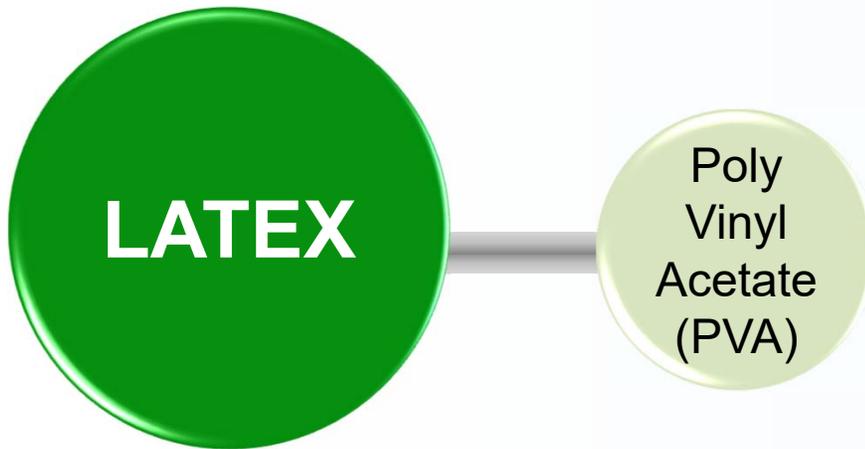
# 100% ACRYLIC



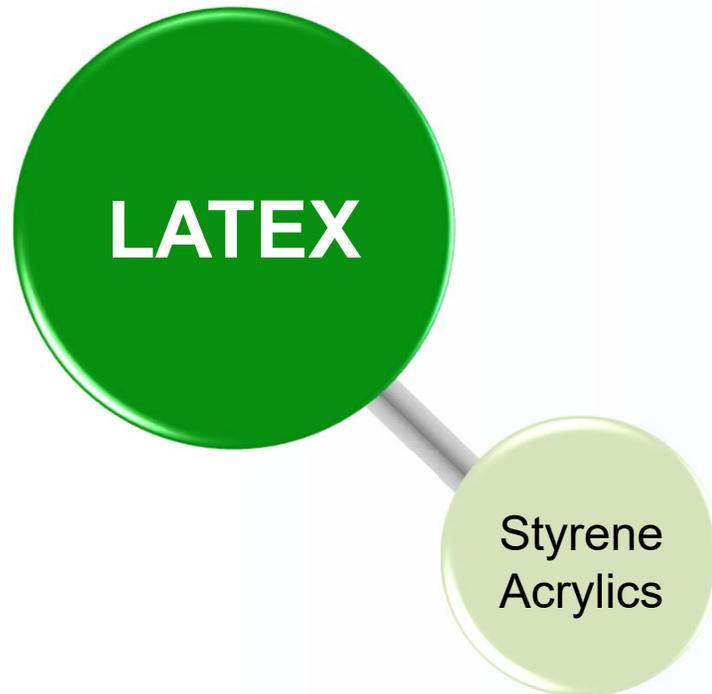
- Interior / Exterior
- Adhesion
- UV resistant
- Alkali resistant
- Efflorescent resistant

# POLY VINYL ACETATE (PVA)

- Interior / Exterior
- Scrub resistance
- Washability

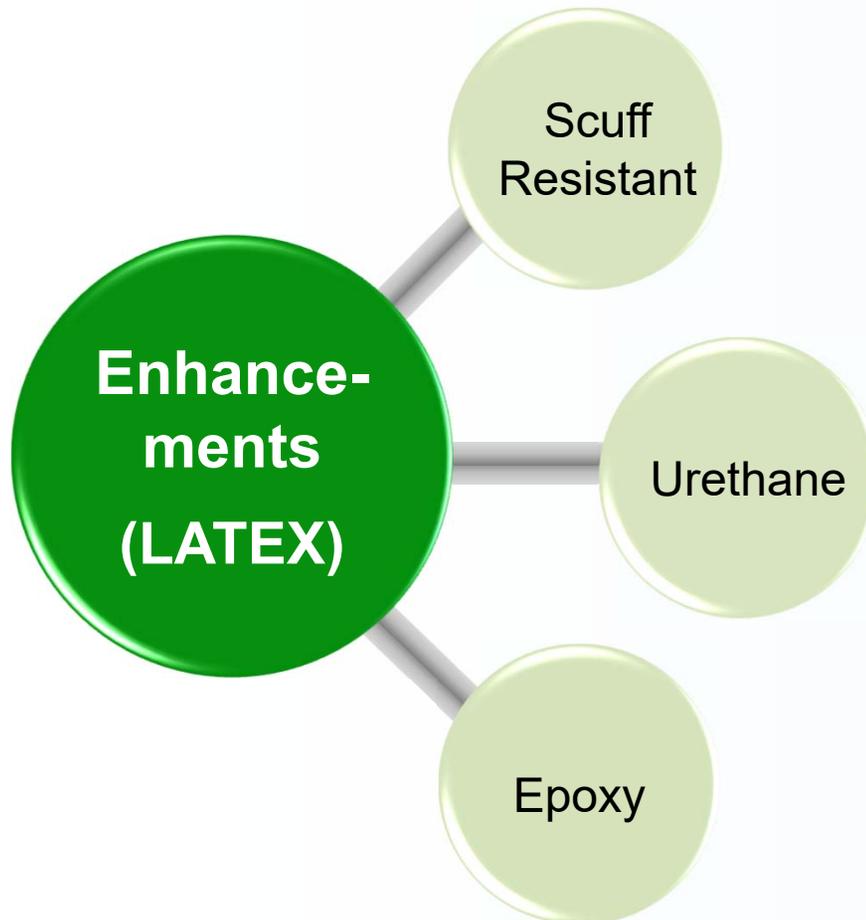


# STYRENE ACRYLICS



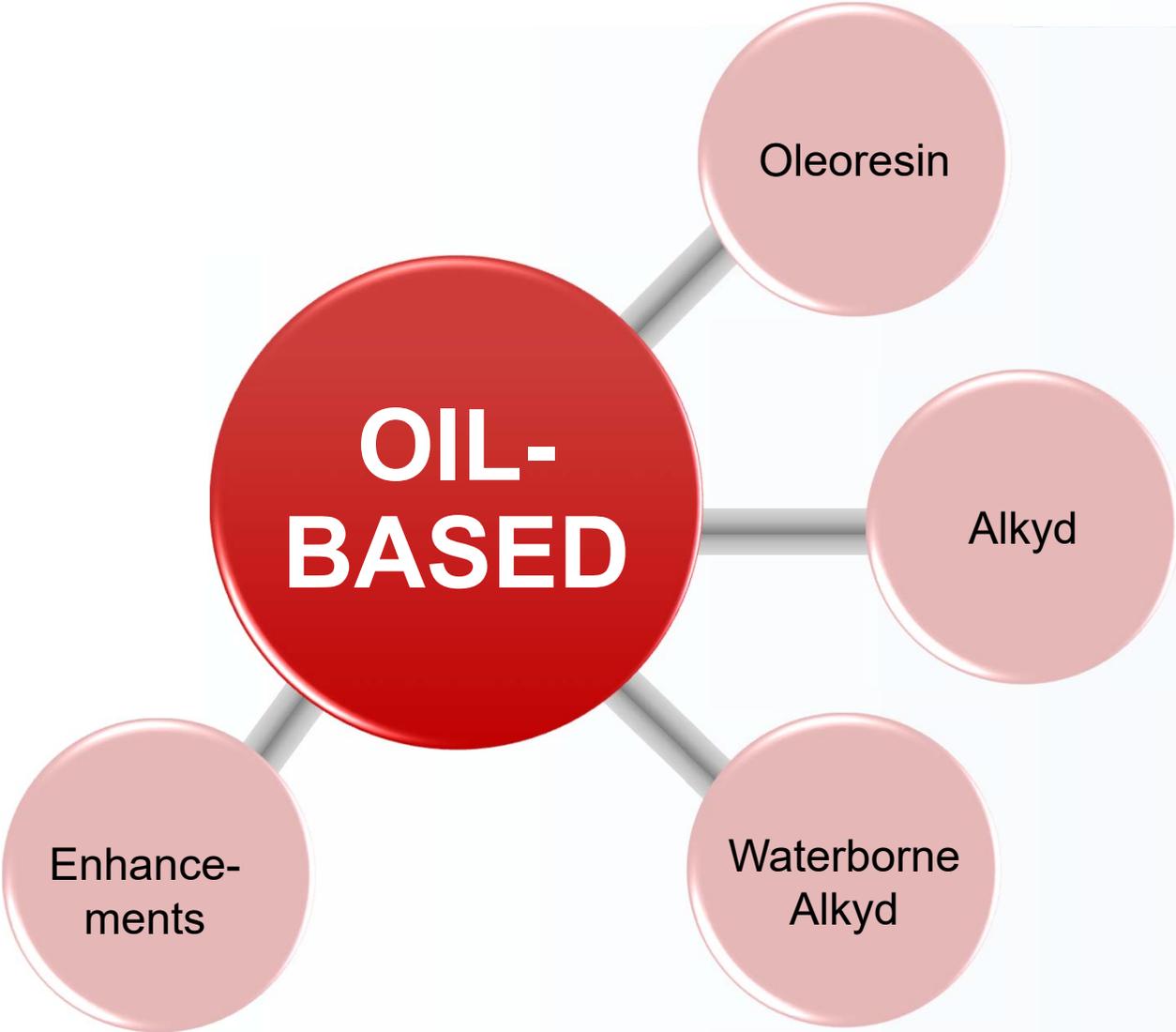
- Interior / Exterior
- Masonry
- Alkali resistant
- Efflorescence resistant

# ENHANCEMENTS

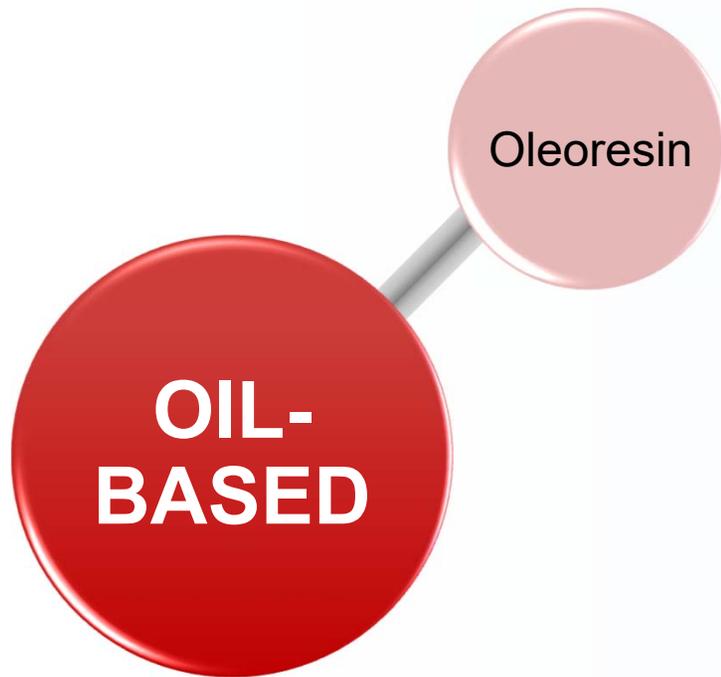


- Scuff Resistant
  - Resists scuffs and marks
- Epoxy / Urethanes
  - Chemical and abrasion resistant
- Low odor / Low VOCs

# OIL-BASED



# OLEORESIN



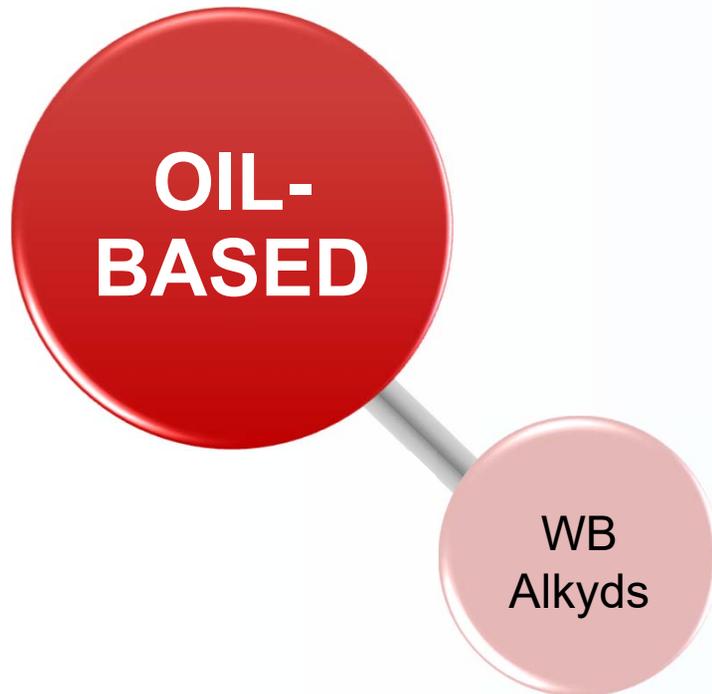
- Linseed Oil
- Yellow
- Finish
- Varnish
- Pigment

# ALKYD



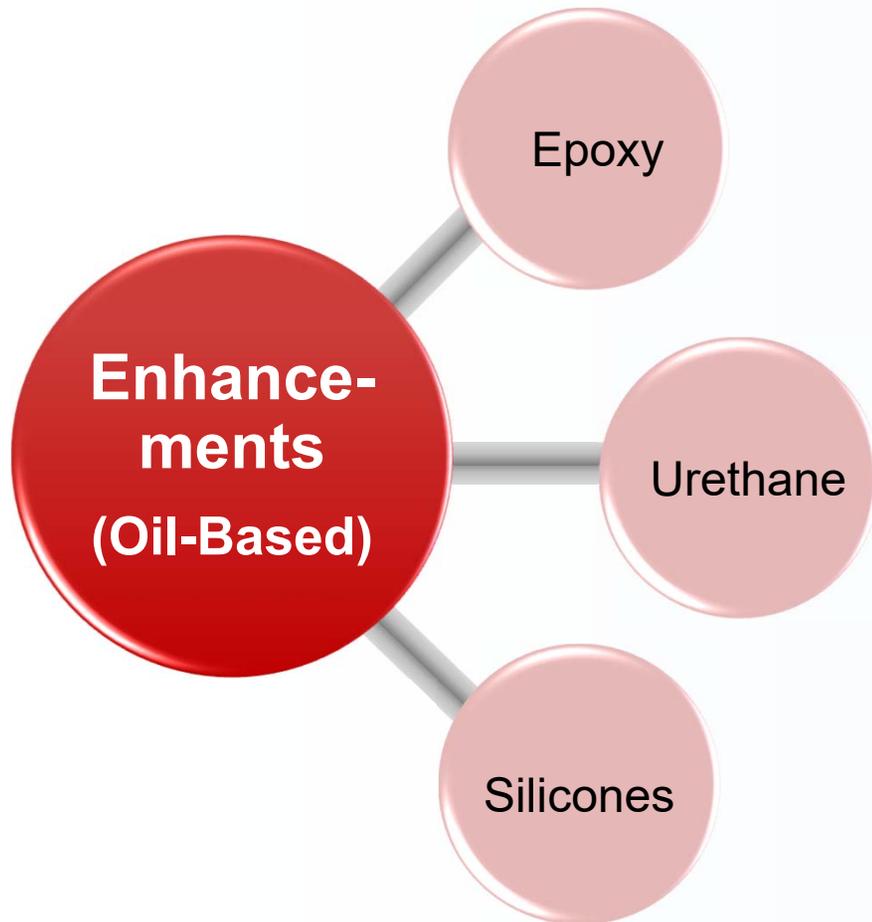
- Interior / Exterior
- Hard film
- Durable
- Excellent penetration
- Strong odor
- High VOCs

# WATER-DISPERSIBLE ALKYDS



- Interior
- Water-dispersible
- Cures to hard, furniture-quality finish
- High Gloss
- Durable
- Low Odor
- Low VOCs

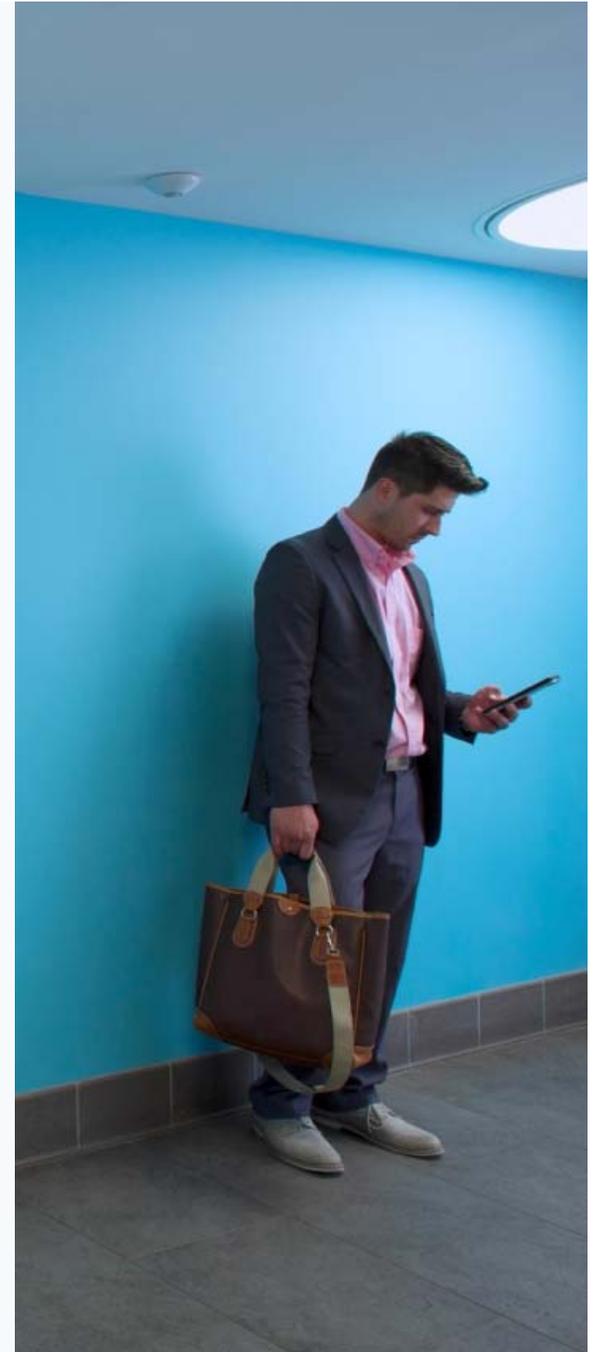
# ENHANCEMENTS



- Extremely durable
- Hard
- Chemical and abrasion resistant
- Two-components
- Strong odor
- High VOCs

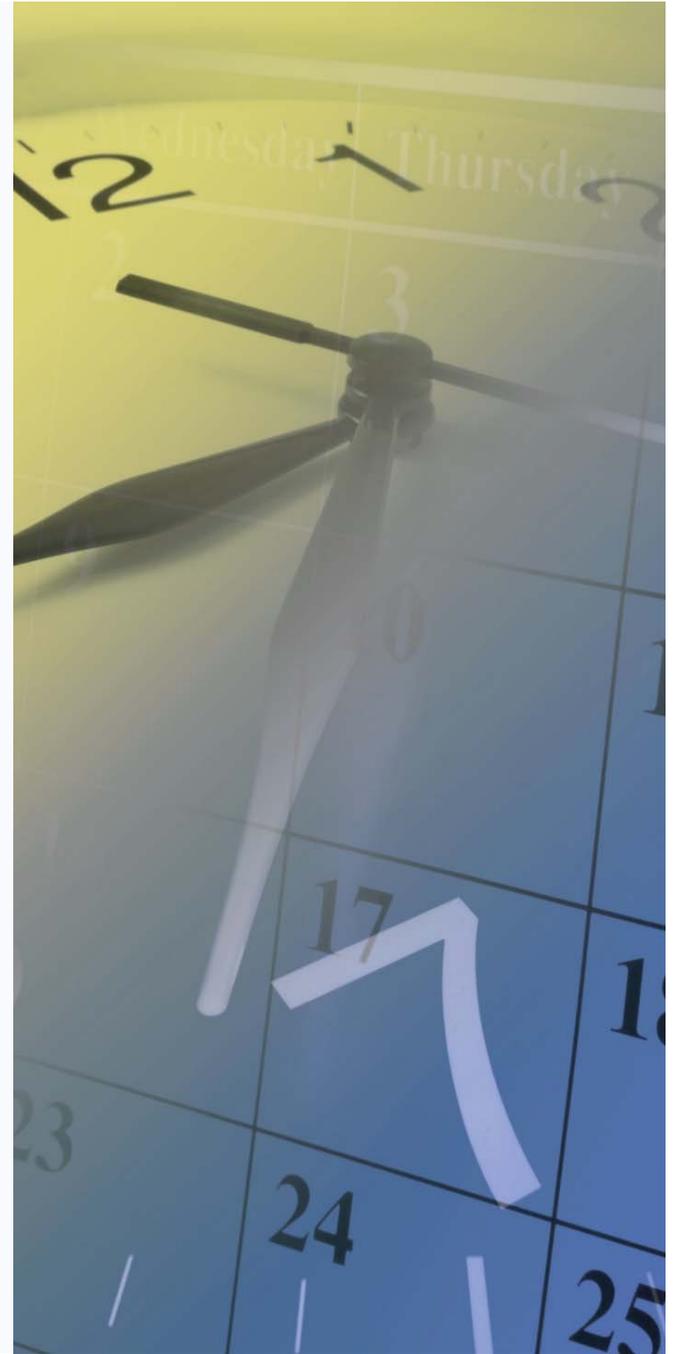
# DRYING VERSUS CURING

- Drying occurs when solvent evaporates from coating
- Curing occurs when coating has reached optimum hardness and chemical resistance



## ALKYDS / LATEX

- Alkyd paints dry in 4 to 8 hours and cure within 10 days
- Latex paints dry in 2 to 4 hours and cure within 30 days



# ADDITIVES



Mildewcide

Flow and Leveling

Film formation

# SURFACTANTS

- Helps incompatible materials work together
- **Example:**  
Water-Dispersible Alkyds



# TYPES OF ADDITIVES

Driers

Anti-Skinning Agents

Defoamers

Coalescing Agents

Biocides

Rheology Modifiers

Dispersants/  
Surfactants

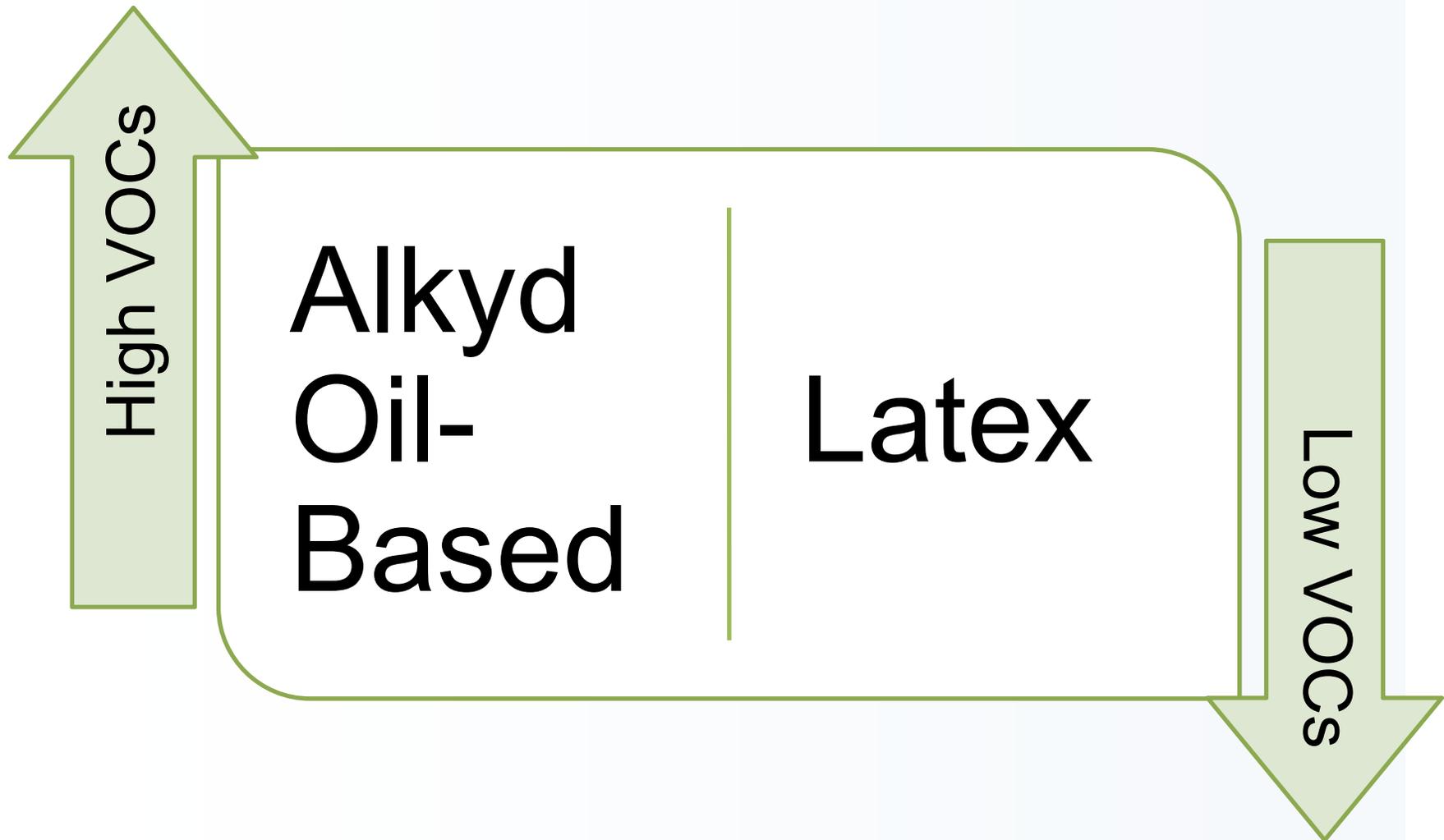
Anti-Settling Agents

# SOLVENTS



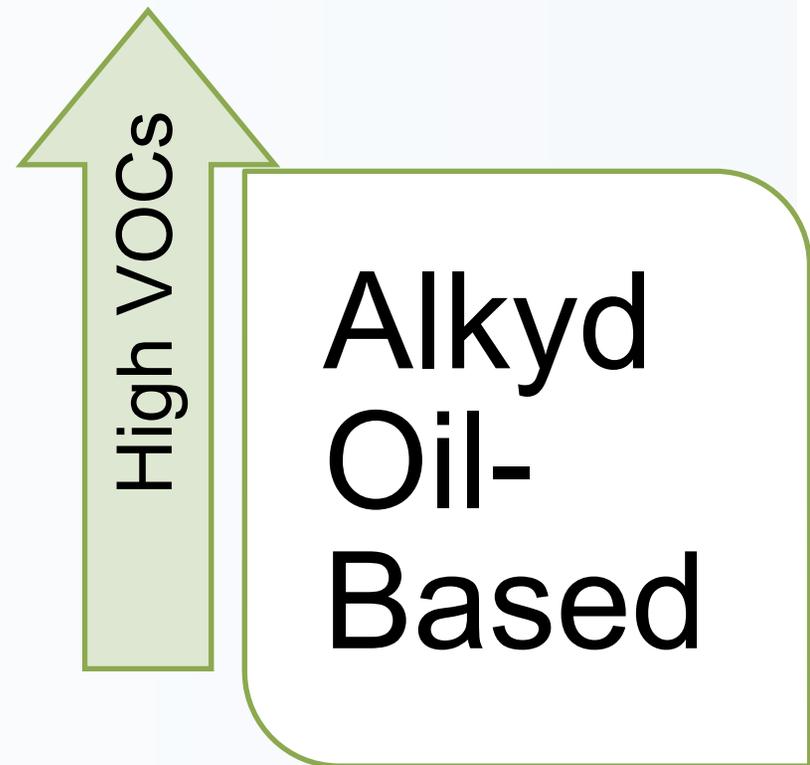
Promote transfer  
Control Viscosity  
Evaporate

# TYPES OF SOLVENTS



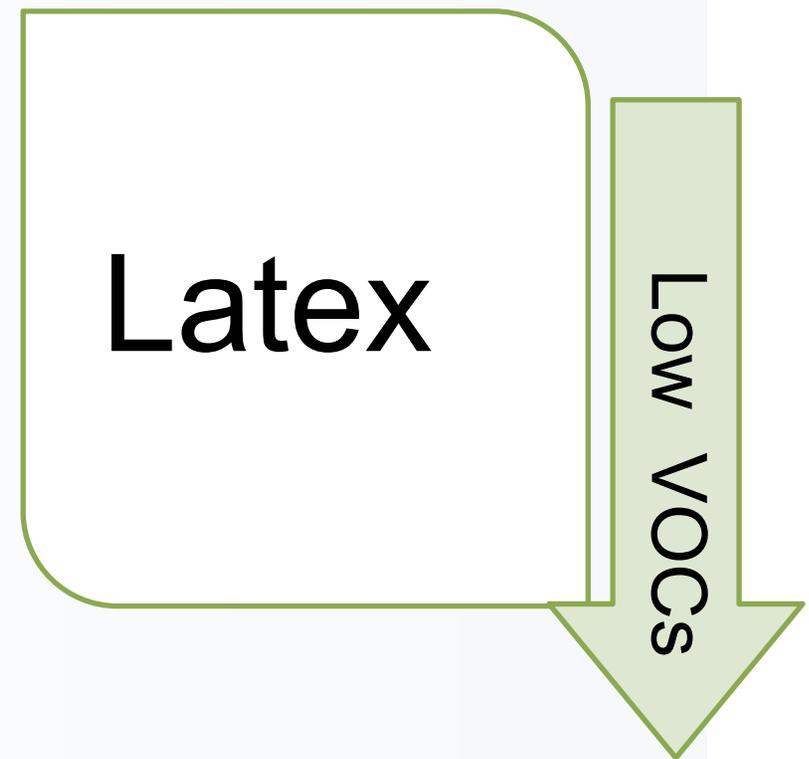
# ALKYD / OIL-BASED

- Types of Thinners
  - Mineral Spirit
  - Hi-Flash Naphtha
  - Xylol
  - Aliphatic Urethane Thinner
  - Methyl Ethyl Ketone
  - Epoxy Thinner



# LATEX / WATER-BASED

- Types of Thinners
  - Water
  - Ethylene Glycol
  - Propylene Glycol



# VOCs



# WHERE ARE VOCs?

- Alkyd / Oil-Based Solvents
- Coalescing Aids
- Glycols
- Universal Colorants



# VOC CONTENT & EMISSIONS

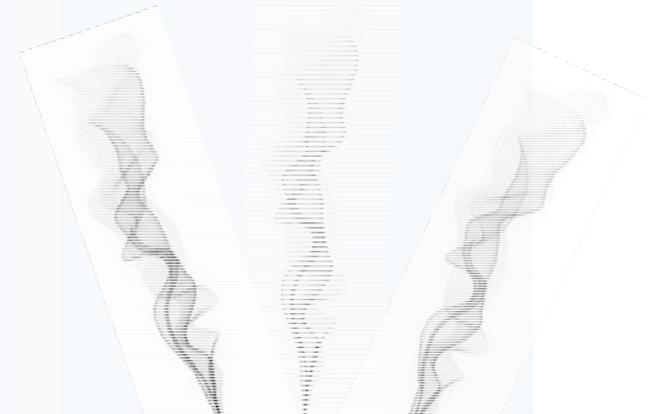
## VOC Content

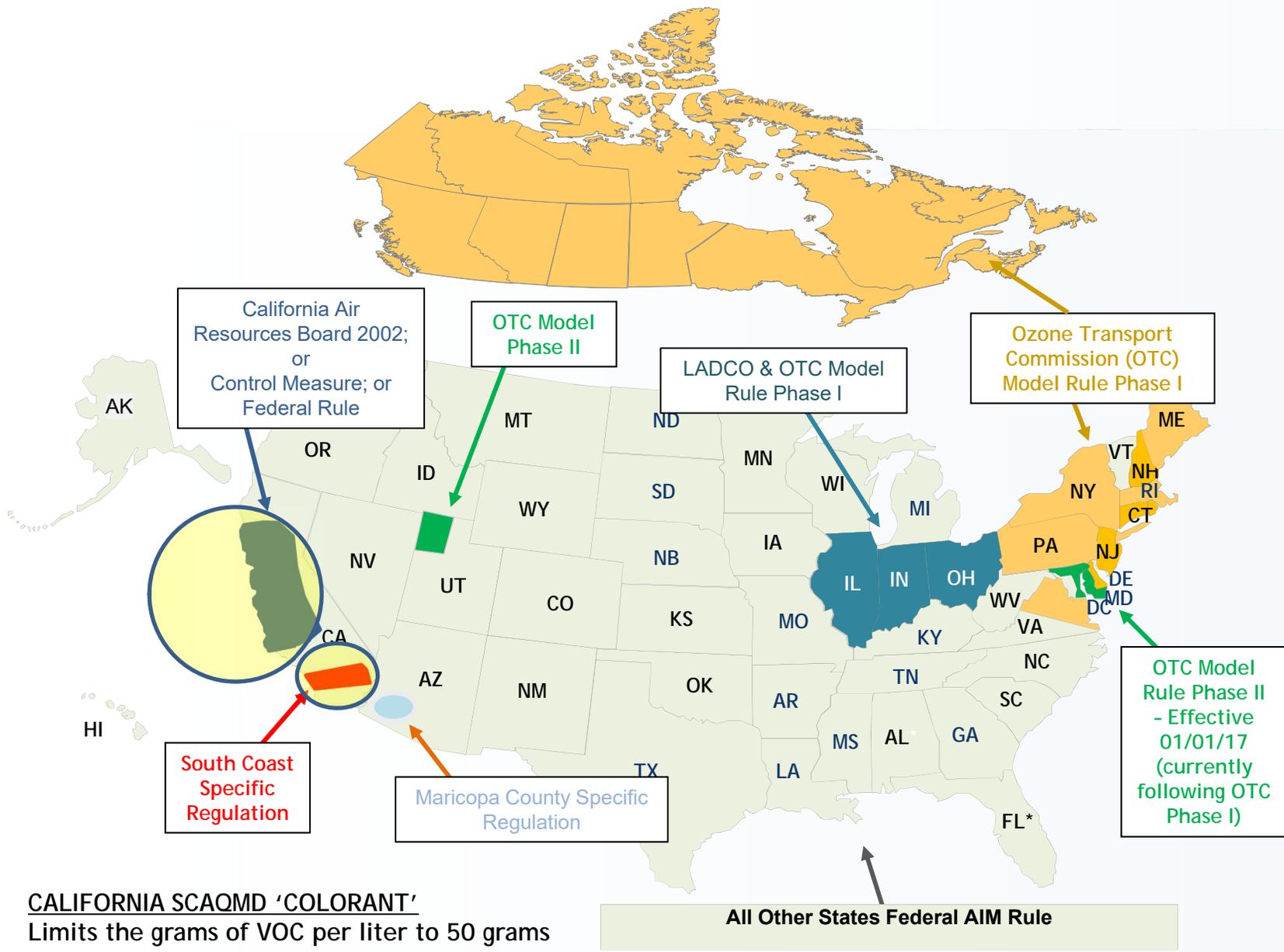
- Chemicals such as heavy metals, pesticides or toxic materials

## VOC Emission

- VOCs evaporate into the air from product as paint dries

**Emissions**





# CERTIFICATIONS



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## Greenguard

Certifies product safety  
for human and  
environmental health



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## CHPS

Standard testing for  
VOC emissions



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## Green Seal

Harmful chemicals and  
performance

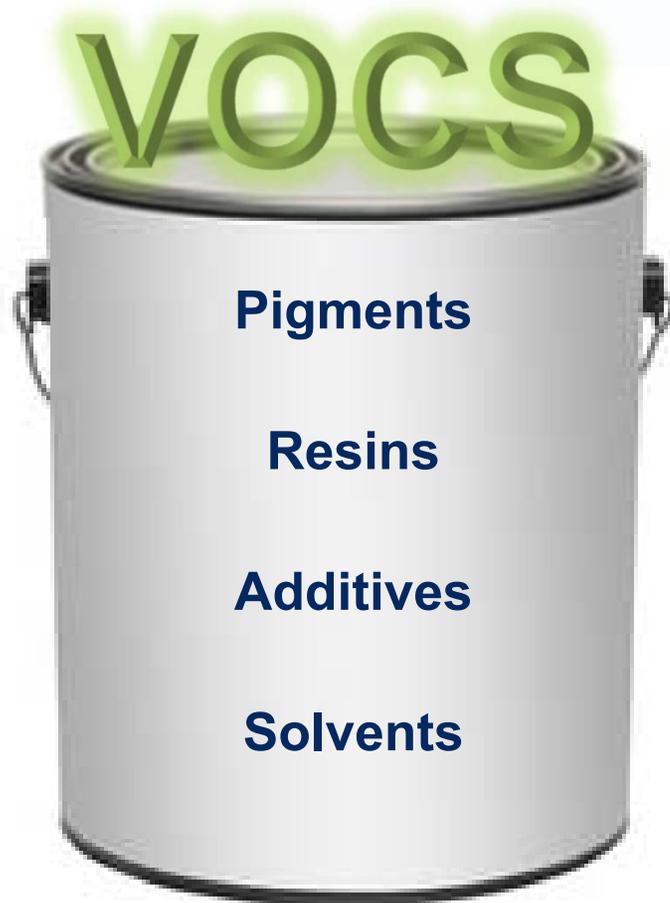


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## Master Paint Institute (MPI)

Performance, VOC Content and  
CHPS Emissions

# REVIEW



**Pigments:** Color and hide; protection of substrate

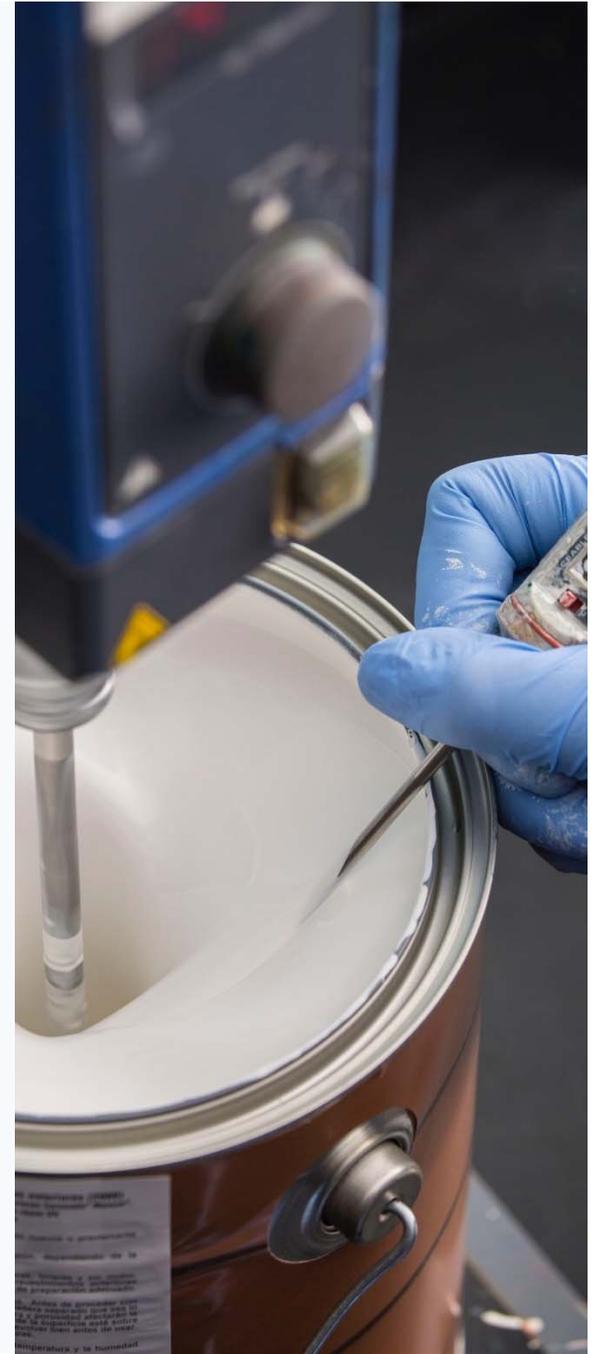
**Resins / Binder:** Hold pigment particles together; film integrity and adhesion

**Additives:** Provides specific properties (e.g. mildew resistance, foam control, etc.)

**Solvents:** Thin coating for easy application (spreading)

**VOCs:** Federal and State regulations limit VOCs in untinted paint and colorants

# GLOSS AND SHEEN



# GLOSS AND SHEEN



## **Gloss**

**Satin / Semi-Gloss / Gloss**

Reflect more light

Durability and Washability

Accentuate surface defects,  
imperfections and texture



## **Sheen**

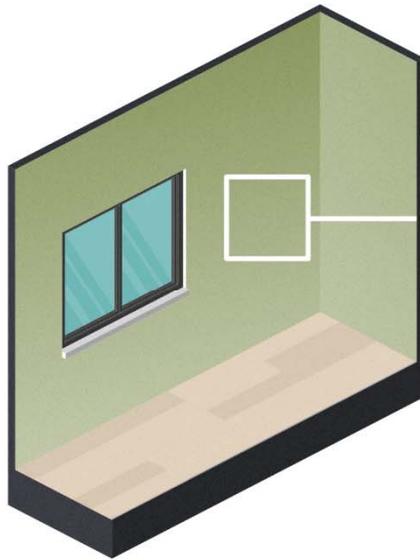
**Flat / Matte / Eggshell**

Diffuse light

Hide surface imperfections

Easy touch-ups

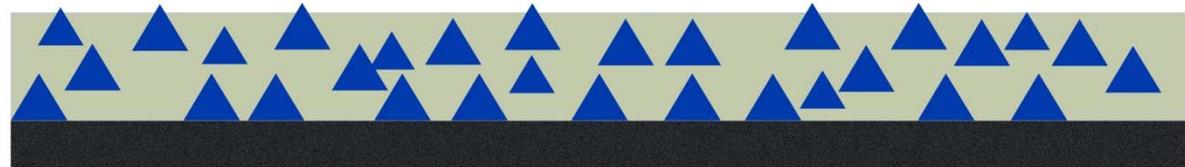
# GLOSS AND SHEEN VARIATION



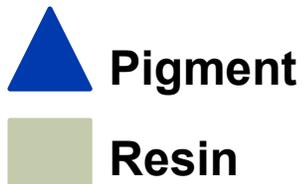
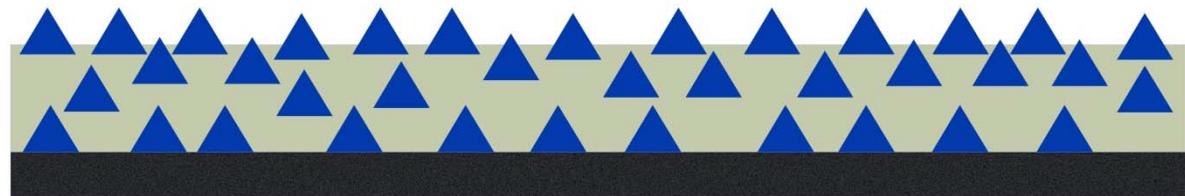
**Gloss**



**Semi-Gloss**

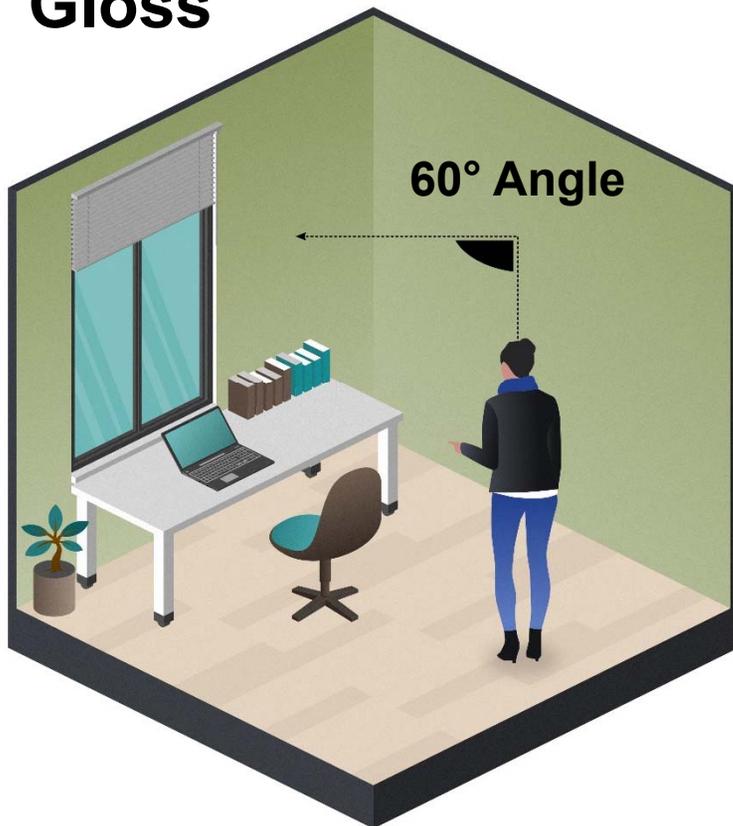


**Flat**

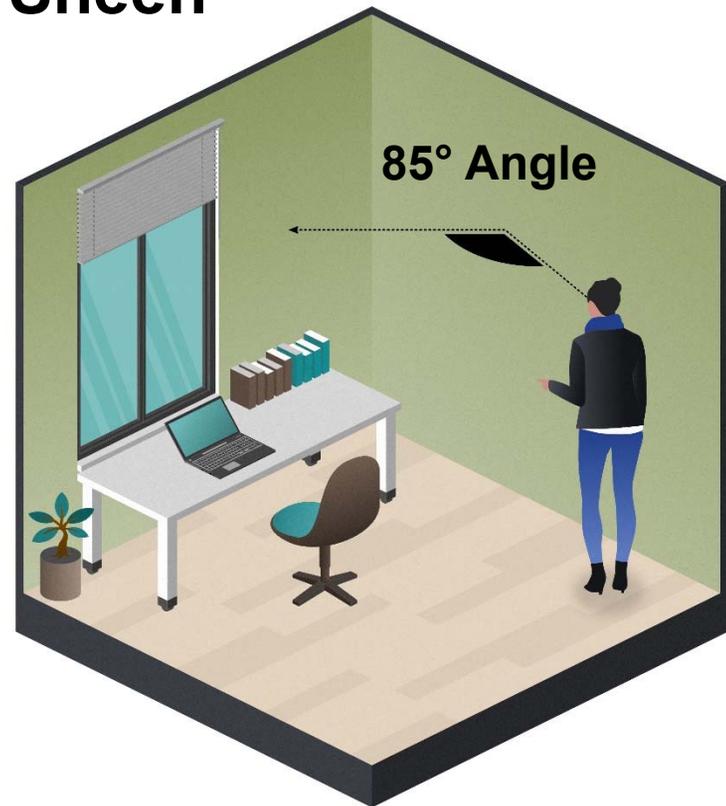


# GLOSS AND SHEEN

## Gloss



## Sheen



# MPI GLOSS STANDARDS

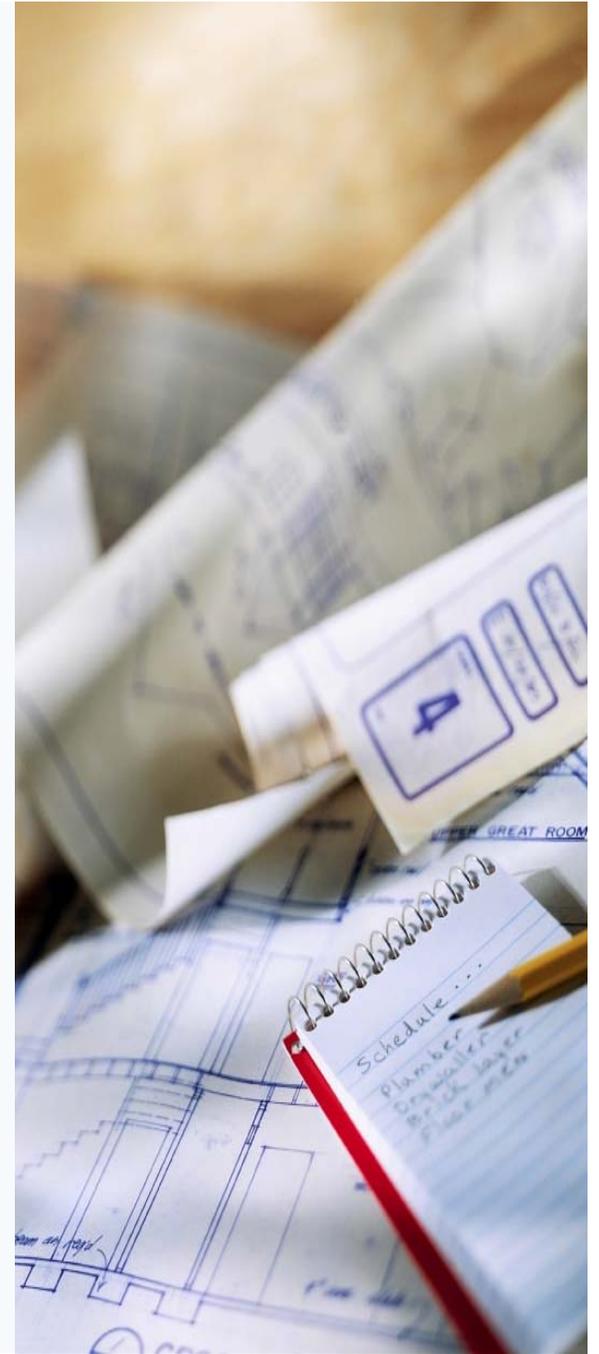
MPI Gloss Standards		Gloss @60 degrees	Sheen @85 degrees
Gloss Level 1	a traditional matte finish - flat	maximum 5 units	maximum 10 units
Gloss Level 2	a high side sheen flat - a 'velvet-like' finish	maximum 10 units	10-35 units
Gloss Level 3	a traditional 'eggshell-like' finish	10-25 units	10-35 units
Gloss Level 4	a 'satin-like' finish	20-35 units	minimum 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	
Gloss Level 7	a high gloss	more than 85 units	

# TECHNICAL DATA SHEET

Eggshell	Gloss @60 degrees	Sheen @85 degrees
Brand A	10-12 units @60°	10-21 units @85°
Brand B	5+ units @60°	15-20 units @85°

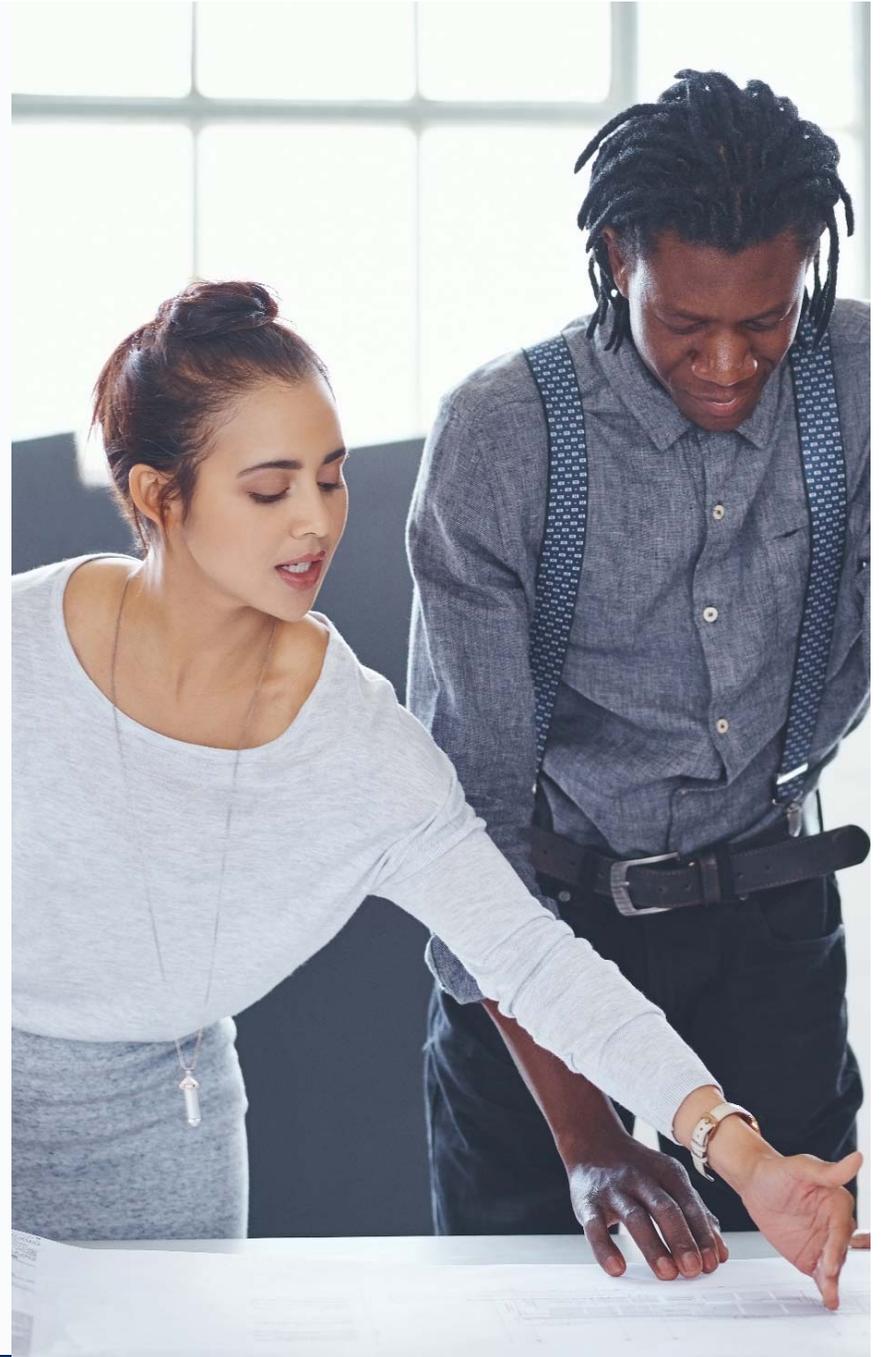
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# SPECIFICATION



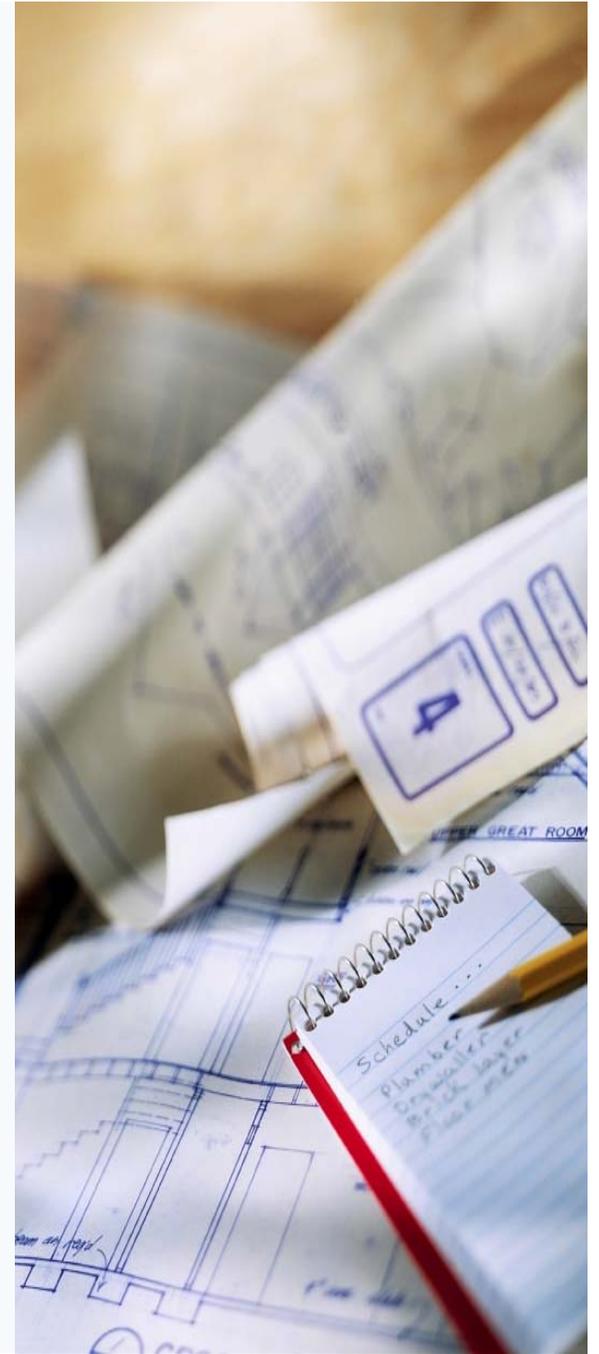
# MANUFACTURER REP

- In-depth knowledge of paint components
- Experts in residential, commercial, and industrial specifications
- Well-versed green building standards
- Qualified to recommend cost-effective solutions



# KEY VARIABLES ADDRESSED

- Type of project
- Environmental conditions
- Performance expectations
- Project location
- Type of substrate
- Preparation and applications
- Certifications
- Budget: Initial cost and maintenance expectations



# PAINT TECHNOLOGY



# SCUFF-RESISTANT PAINT

## Challenge

- High-traffic areas
- Constant contact with people, furniture equipment
- Demand constant maintenance and repainting

## Paint Technology

- Scuff-resistant paint
- Resists scuffs and marks
- Easy to apply single component
- Minimize cost and maximize service



# WHAT'S IN THE FUTURE?

## Paints that change color:

- Thermochromic
- Photochromic
- Electrochromic

## Functional Paints

- Biotechnology
- Improved Additives
- Carbon-Nano-Tube Technology
- Enhanced Marine Coatings



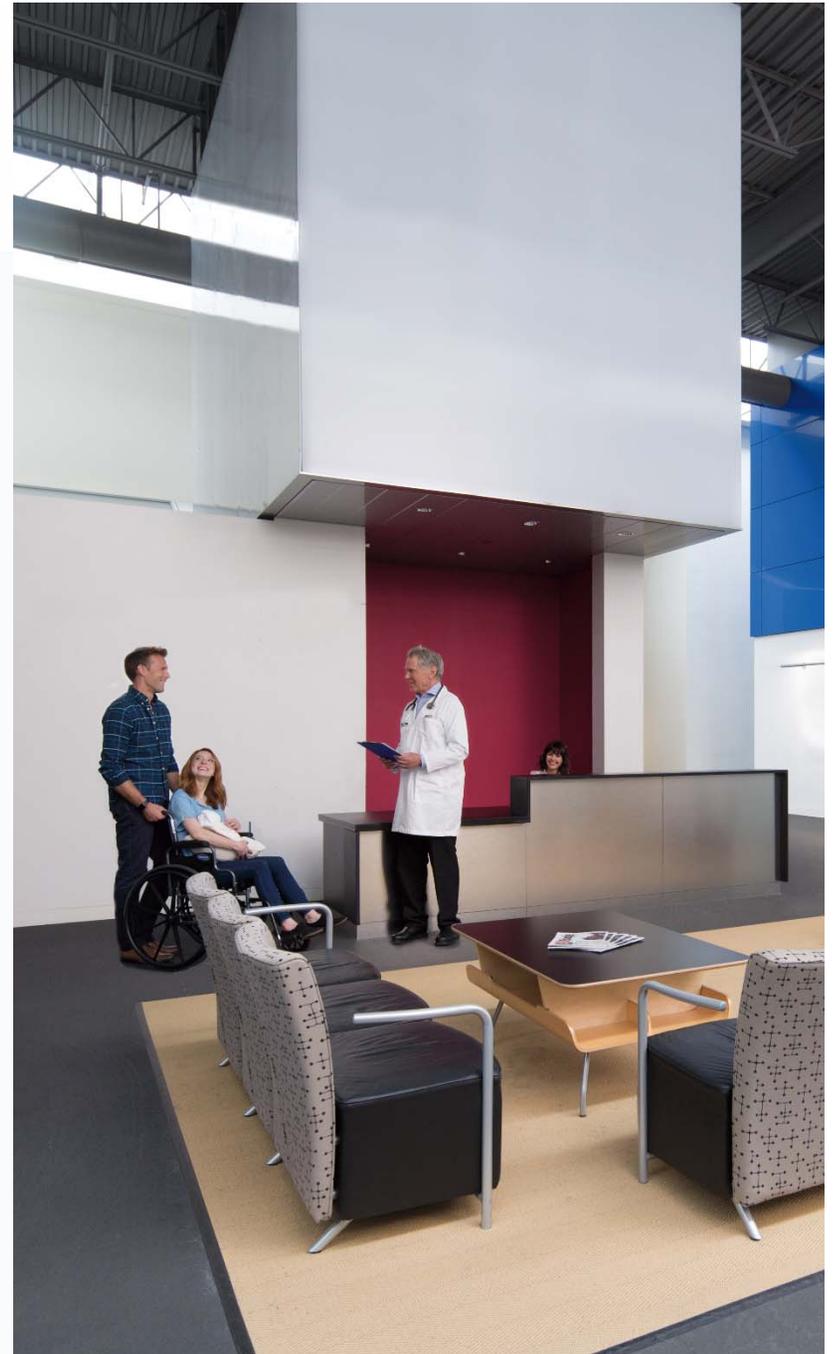
# SUMMARY

- Explained the different functions of the four components of paint and their impact on performance
- Distinguish among the different aesthetic and durability features of paints finishes
- Described the role of a Manufacturer Rep in the specification process
- Reviewed the benefits of the latest paint technology and explored future innovations in the paint industry.

Thank you!

# BENJAMIN MOORE SCUFF-X™

- Extreme durability for high-traffic areas
- Proprietary scuff-resistant technology
- LEED V4 and CHPS certified





# RESOURCES

Benjamin Moore & Co.

Britannica. <https://www.britannica.com/technology/pigment>

Coatings World, August 2017

Collaborative for High Performance Schools

Master Paint Institute (MPI)

Environmental Protection Agency

Green Seal

Greenguard

Hunker. Differences in Oil-Based Paints and Alkyd Paints.

<https://www.hunker.com/13413010/differences-in-oil-based-paint-alkyd-paint>

Master Paint Institute (MPI)

Mineral Technologies. Specialty Coatings. <http://www.mineralstech.com/Pages/SMI/Paint-and-Coating.aspx>

Wikipedia