Paint

INTRODUCTION

Paints, stains, and other architectural coatings are the second largest emitters of Volatile Organic Compound (VOC) after automobiles. VOCs can cause respiratory, skin and eye irritation; headaches; nausea; muscle weakness; and more serious ailments and diseases. Indoor concentrations of VOCs are regularly up to ten times as high as outdoor concentrations, and can climb up to a thousand times as high as outdoor concentrations when you are applying paint.

Fortunately, you can easily avoid noxious emissions and unsafe living spaces and still have beautiful walls of any color by using low- VOC, zero-VOC, recycled, or natural paints with zero toxicity and heavy metals concentrations.

COMPOSITION OF PAINT

All paints have three main components:

- **Pigment:** gives paint its color, but also plays a role in its consistency, ease of application, durability and hardness, it is usually of mineral origin. Pigment can contribute to paint's emissions in a significant way. Much of the latex and oil paint sold in stores comes as white base paint; pigments are added to create the desired color at the time of purchase. These add some VOCs to the base paint, so actual VOC emissions will almost always be higher than those quoted on the base paint. The deeper the hue, the more pigment needed, and therefore the more VOCs the colored paint contains.
  Toxic substances used in a pigment should be listed on its material safety data sheet (MSDS). Pigments may include heavy metals like cadmium, chromium, mercury, lead, etc… Pigments production normally involves high energy consumption and pollution.
- **Binder:** is the *Body* of the paint, it makes the pigment stick to the surface and helps the coat of paint retain its structure; binders can be of natural origin or synthetic resin but are mostly organic substances.
- **Solvent**: it thins the paint and provides for ease of penetration into the surface texture and vaporizes once paint is applied, solvents are mostly organic and can be of mineral or vegetal origin with mineral solvents being the most hazardous to health and environment. Water is without doubt the optimal solvent from an environmental and health viewpoints.
  Paint may contain also additives such as fungicides, drying retardants, softeners, anti-corrosion, thickeners, etc… which are often toxic to humans.

TYPES OF PAINT

Paints are usually categorized based on the type of binder used whether mineral (slaked lime, silicate cement), vegetal (linseed oil, starch, cellulose glue), animal (protein glue, blood, casein) or synthetic resin (Alkydes, Vinyl & Polyvinyl Acetates, Acrylates, …).
Here below is a brief description of the environmental and health effect of each type.

- **Latex Paints (acrylic or vinyl acetate binders)**
  Because they use water as solvent rather than oil based products, latex paints have lower VOC levels than oil-based paints. While they don't cover stains as well as their oil-based counterparts, low- and no-VOC latex paints perform well for most household applications, and high-quality latex paint can be as durable as an oil paint. They account for over 70% of household paint sales. Latex paint actually contains no latex, so it won't affect people with latex allergies. It can also be "recycled" by combining leftovers; oil paints cannot be recycled in this way. Using recycled latex paint avoids the manufacturing impact, but recycled paint may not be made of low-VOC paint, so it is best suited to well-ventilated areas like the interior of a garage. Green Seal now has a standard for Recycled-Content Latex Paint (GS-43); paints that are certified under this standard cannot contain more than 250 g/L of VOCs.
  There are two types of recycled paint,: reprocessed and reblended. Reprocessed paints are high-quality and generally tested to meet the same standards as virgin paints, while reblended paints are consolidated leftover paints.
- **Natural Paints (natural oil or casein binders)**
  "Natural" paints are made mostly of renewable or abundant naturally occurring materials such as citrus oil, lime, clay, linseed oil, casein, milk and chalk. These paints can create a vibrant, nicely textured, "old world" or "wash" look (particularly lime plaster paints) or a look similar to traditional even-toned paints. Because natural paints do not contain petroleum products, they emit few if any of the VOCs the EPA regulates for smog, though they may contain significant amounts of other VOCs from ingredients like citrus-based solvents. Overall, natural paints are healthier and more environmentally sound than latex or oil paints. Natural paints typically use linseed and soy oils as binders, pine-and balsam-derived terpenes or citrus oils as solvents, minerals and sometimes plant-derived compounds as pigments (like chrome oxide for green), and lime and chalk as thickeners. These paints are preserved by linseed oil or other natural ingredients.
- **Oil Paints (petrochemical/synthetic binders)**
  Oil paints, also known as alkyd or enamel paints, use binders derived from petrochemicals. And because of their petroleum-based binders and solvents, oil paints typically emit more VOCs than other paint types. Oil paints contain more compounds with known health effects, such as toluene, xylene, and benzene, and take longer to dry, allowing higher concentrations of VOCs to be emitted for longer periods of time. Oil paints also contain naturally occurring preservatives, so they are inherently toxic to mold and mildew and require fewer additional biocides than latex paints.
  Oil paints are widely available and some are less expensive than latex paints. Disposing of oil paints is difficult because they cannot be recycled as latex paints can, but must be "downcycled" into other petroleum-based products or incinerated for energy after they are brought to disposal sites. Cleaning up oil paints typically calls for the use of solvents that release VOCs (though vegetable oil can be used as an alternative to toxic cleaning solvents). Beyond durability (paint longevity) concerns, at no stage in oil paints' lifecycle, from petroleum extraction to paint disposal, are they cleaner or greener than latex or natural alternatives. For indoor applications they should be used only where necessary.
  When buying oil paints, look for the lowest VOC product that will do the job. The EPA requires VOC content of less than 380 g/L, Mercury-free oil paints are also available; this heavy metal and other toxins should be disclosed on the MSDS.

PAINTS SYNOPTIC TABLE

Most important properties to look for in a paint are: *moisture diffusivity; sensitivity to water, to mould growth and to light; resistance to wear; durability; VOC emissions and toxicity potential.* Here below is a comparative Table that assesses the performance of the three major types of paints based on these factors.

Advantages	Disadvantages
1. Low- to zero-VOC Latex Paint	
- Durable, Elastic finish, Easy to clean - Suitable for kitchens, bathrooms and exterior (acrylic) - Indoor applications (vinyl) - Many colors available (> 1,400) - Cheapest of all eco-friendly paint	- Very low moisture transmission - Dries and cracks with moisture and time (10-15 years) - Contains toxic chemicals, could give light headedness feeling - Low chemical smell - Discharge of left-over harmful to groundwater /environment
2. Natural Paints	
- 99% natural ingredients - Little odor, smells earthy and clean - Interact with rooms' climate (i.e. 'breathe' – expand & contract with changes in temperatures and absorb humidity & odors) and hence very durable – 40 years and plus - Ideal for Faux Finishes and textures! - Minimal adverse impact of discharge/left-over to Groundwater - Relatively clean manufacturing process - Least toxic paint	- Porous finish needs sealing with natural wax to protect from stains and liquids - Less colors available than latex paints (100) - Some preservatives include biocides - Plasters come in powder form and require mixing with water - Natural oil paints as citrus oil emit odors - Take more time to dry - Need more extensive propping and priming - Cost 20 to 80% more
3. Oil Paints	
- High Durability , Water resistant - Suitable for kitchens, bathrooms and exterior - Highest gloss finish - Less expensive than Latex	- Very low moisture transmission - Environmentally harmful manufacturing process - Health effects - Difficult to dispose of, Cannot be recycled

RECOMMENDATIONS

- Make sure painted surface is lead-free otherwise assume that paint coat contains lead before preparing surface for repainting**.**
- Select an appropriate paint that matches the surface to be painted.
- Use if possible light colors, they will reduce the need for artificial lighting
- Always read and follow all the instructions and safety precautions on the label and technical data sheet (TDS).
- During interior painting, minimize exposing people to odors and contaminants.
- Use exhaust fans to remove paint fumes from building. Keep new buildings ventilated for at least 4 weeks before occupancy.
- Use Appropriate Storage and Disposal Practices for Paints, Solvents, and Clean-up Materials.
- Use and handle paint strippers properly.
- Reduce paint waist by purchasing the right amount.
- While paint extends the life of many building materials, consideration should be given to options that don't require paint, such integrally-colored plasters, ceramic tile wainscoting, and natural wood. Also, sometimes simply washing walls and/or using a little touch up paint can make them look like new.
- When shopping for paint, do not be fooled by what some paint manufacturers or store clerks may tout as "Low-VOC" Paint. All household paints meet EPA and regulations, which call for no more than 250 gm/l (grams per liter) of VOCs in "Low-VOC" latex paints and no more than 380 gm/l for "Low-VOC" oil-based paints. However, these limits are based primarily on reducing ozone formation and not on human health considerations. Toxic chemicals that do not form ozone are excluded from the required VOC calculations, as are toxic heavy metals.
- Fungicides and Biocides are toxic chemicals that are used to prevent mildew growth and extend the shelf life of the product. They may be good for the paint, but they are bad for your health. These chemicals contaminate both indoor and outdoor air for five years or more after the product has been applied! Beware: even low- or no-VOC paints contain these toxins.
- One popular no VOC paint contains crystalline silica which has been shown to produce cancer in rats and perhaps in humans, yet the paint was awarded the "Green" label. Further, some paint companies, in their quest to reduce VOC's, have added chemicals (usually toxic) to mask the offensive paint smell!!!
- Some paints contain ammonia and acetone which are highly dangerous chemicals to human health yet they are not required by law to appear on the label.
- Look for flat paints that have no more than 75 g/l VOC content, and non-flat paints with no more than 150 g/l VOC content. EPA rules allow paints labeled "zero-VOC" or "no-VOC" to contain up to five grams of VOCs per liter (g/L) in addition to VOCs that have been exempted from the rules.

References:

-www.epa.gov, Healthy Indoor Practices – publication.
-www.builditgreen.org, - www.greenbuildingssupply.com, - www.greenhomeguide.com, -www.ecopaintpro.com