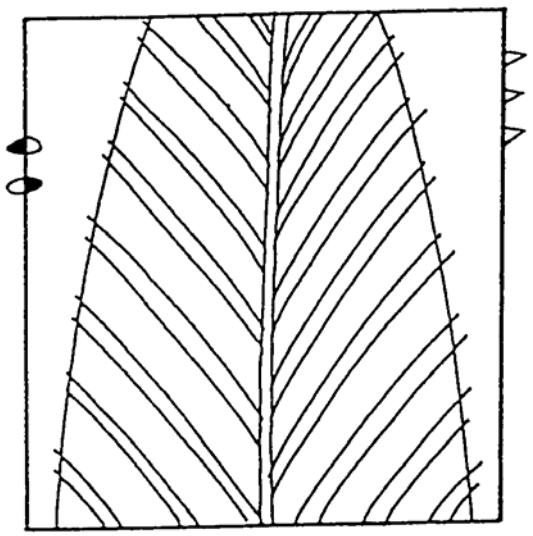
PAINT





Waitakere City Council
Te Taiao o Waitakere

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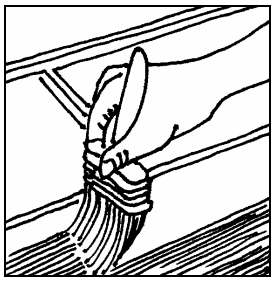
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This chapter is part of the Waitakere City Council's Sustainable Home Guidelines. The complete set can be obtained through most libraries or from the Waitakere City Council, Private Bag 93109, Henderson, Waitakere City 0650, New Zealand, phone (09) 839 0400, email: info@waitakere.govt.nz.

The guidelines are also available on the council's web site: http://www.waitakere.govt.nz

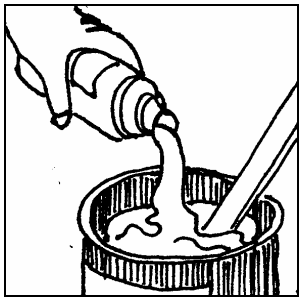
Why do we use paint?



Many surfaces in the average home are painted – furniture, walls, ceilings, wooden floors, exterior cladding, and roofs. Paints have been used for centuries to make surfaces more attractive, easier to maintain, or to protect them from the elements. Paints and finishes can extend the lifetime of some materials, such as weatherboards, dramatically.

On the other hand paint is often not needed to prolong the life of a material. Plaster, concrete, galvanised steel, brick, even many timbers in the right circumstances, do not necessarily need a protective coating. With good design, such materials can look attractive in their natural state as well as reducing resource use and maintenance.

How is paint made?



Paint is made from three basic ingredients: A colouring agent or pigment to provide colour, a resin or binder to bond the paint into a protective skin, and a solvent which keeps it liquid until you brush it on and then evaporates away as the paint dries. Other ingredients can be added, such as preservatives and fungicides.

Colouring agents and pigments

There are three main types of colouring agents: natural pigments, metal oxides, and synthetic colouring agents. **Natural pigments**, such as earth, have been used for thousands of years and many examples are still well preserved today. **Metal oxides** are produced by a reaction of metals with air and moisture and some occur naturally. Many metal oxides are poisonous. The manufacture of lead, tin, copper, titanium, chromium, mercury and cadmium are associated with the production of toxic waste. Lead-based paint is an ongoing problem when older houses are prepared for repainting. Lead dust in the air or concentrated in garden vegetables can pose a serious risk of brain damage to those exposed. **Synthetic colouring agents** are the products of more complex chemical reactions, but the line between metal oxides and synthetic agents is blurred and they are often mixed in the same paint. There are now many organic pigments (complex organic compounds) that are replacing metal-based pigments, because of the toxicity of many metal oxides. Most of these organic pigments are derived from benzene, toluene, xylenes, naphthalene, anthracene and phenols, all of which are products of the petrochemical industry. Many of these colouring agents are toxic and can be harmful through exposure to either the end product or the manufacturing process. Different types of colouring agents are often mixed to get the desired effect.

Resins

Many types of resins are used to bind paints and form a waterproof skin, especially in industrial applications. The following covers the five resins you will come across most often in house painting.

Until the 1960's the most commonly used resin was **linseed oil**. Linseed is grown and processed in the South Island. Linseed oil by itself will take two to three days to dry, but the addition of metallic compounds can reduce this time. These compounds are generally toxic.

Today the most commonly used resins are **alkyd resins**, a type of polyester used to bind **enamel paint**. Alkyd resins are modified by adding oils, or other substances, to the chemical reaction that forms them. This changes the quality of the finish and the durability.

Water-based **acrylic** paints contain pigment suspended in an acrylic polymer emulsion. Even though they often contain toxic substances they are generally preferable to oil-based paints. There are now formulations available with characteristics of hardness and wearability not previously associated with water-based paints.

Epoxy resins are derived from oxirane-ethylene oxide, but additives are often used to improve their properties. These can include formaldehydes, melamines, alkyds and even drying oils, such as linseed oil.

Polyurethane resins are derivatives of urethanes, which are produced by reacting hydroxyl functional resins with polyfunctional isocyanates. Isocyanates can cause respiratory problems when fumes are inhaled. Polyurethane is one of the more toxic paint products commonly used.

Solvents

Many paints use more than one type of solvent. The solvent has to dissolve the resin, but this alone often results in paint that is too viscous, so thinners are added.

The most basic solvent is **water**; hence the term "water-based" paint. However acrylic paint, even though water based, often uses other solvents as well as water.

Oil-based enamel paints generally contain **mineral turpentine** as the main solvent. Other commonly used solvents include: toluene, xylene, methylethyl ketone, methyl isobutyl ketone, butyl acetate, and 2-ethoxyethylacetate. There are **natural turpentines**, which are volatile hydrocarbons, but which occur naturally. These are used in "natural paints".

The purpose of the solvent in enamel- or oil-based paints is to dissolve the oils in the resin. Because they dissolve oils and fats, they can also dissolve body fats, such as skin grease and the fatty tissue protecting the nerves. Solvents can cause dermatitis and nerve disabilities. Repeated exposure to high levels can cause liver damage.

Evaporating **hydrocarbons –** contained in most paint solvents – cause the distinct smell associated with paint. Hydrocarbons can irritate the skin and cause respiratory problems. Inhaling hydrocarbons can cause oxygen shortage to the brain, resulting in dizziness. In severe cases – as often observed in glue sniffers – hydrocarbons cause brain damage.

Paints and varnishes account for a significant proportion of the hydrocarbons released into the atmosphere. Many paint manufacturers have reduced the amount of hydrocarbons in their products, and there are many hydrocarbon-free paints available.

Choosing the right paint

Choosing the most environmentally friendly paint for the job can be difficult. The issues common to all materials, such as embodied energy and impact throughout the life cycle should be considered (see *Building Materials* chapter). Because of the complicated chemical make up of many paints, however, this can be difficult.

Another problem is that many paints do not fully declare what is contained in them. For some of the more toxic products "material safety data sheets" are required by law. In general, preference should be given to products which fully declare their contents, followed by those which have been rated by an independent scheme with clear and publicly available criteria, such as the "Environmental Choice" label.

Generally speaking, water-based paints are environmentally preferable to enamel or polyurethane paints. Water-based paints have improved dramatically in recent years and are suitable for most applications.

VOCs

VOCs - or **volatile organic compounds** - are substances that evaporate easily at room temperatures. They include chemical classes such as aliphatic and aromatic hydrocarbons, aldehydes, ketones and alcohols. Many paint solvents fall into these classes. Many VOCs adversely affect human health and the environment.

VOCs are found in trace concentrations in most areas of the environment, such as in ground water, where they accumulate over time. Even fish samples from very remote areas such as the Arctic have shown VOC contamination. VOCs are also very reactive, resulting in compounds of unknown effect.

With some paints the level of VOCs is declared on the container. They are generally measured in grams per litre. Choose the product with the lowest VOC level suitable for your application.

Natural paints

There are several natural paints available in New Zealand, although most are manufactured abroad. They are made from renewable resources, such as natural pigments and natural turpentine, in a way that minimises impact on the environment. Natural paints should give a full declaration of all ingredients.

In general they result in a breathing membrane, which means that air can penetrate through the paint. Natural paints are generally based on traditional formulations that have stood the test of time. There are however some limitations, especially when exposed to severe weather conditions, and the distributors should be contacted for advice. Most natural paints have a limited shelf life and are more expensive than more conventional paints.

There are many different types of natural paints available and a suitable product can be found for most applications. Two examples used for centuries are lime washes and silicate paints. **Lime washes** are suitable for plaster, brickwork, stucco, concrete and to a certain extent, earth-walls. Repainting is required more frequently than for conventional paints. **Silicate paints** are based on potassium silicate and they react with the mineral substrate that is painted – this causes the paint to become part of the surface rather than forming a film over the top of it. This type of paint is very durable and has given effective protection in some cases for over one hundred years.

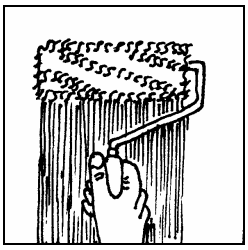
Natural timber can be finished with oil, as an alternative to polyurethane. This will protect the timber while allowing it to breathe. The oil is absorbed into the wood, sealing the pores and stopping water in the liquid phase from penetrating. Oils can also harden the wood and give some protection from UV damage.

Environmental Choice New Zealand

Environmental Choice New Zealand is an independent, government-supported labelling scheme. The aim is to recognise paints which reduce their environmental impact during their manufacture and use. The specification sets out requirements that will provide an environmental benefit by:

- reducing the use and subsequent release of environmentally harmful substances to the environment at all stages of the paint product's life cycle;
- reducing impacts from energy use in production processes;
- encouraging more efficient and effective use of products by consumers; and
- encouraging recovery, reuse, recycling and responsible disposal of unwanted paint and packaging.

The exact specifications, which are expected to become more stringent with time, can be obtained from the website www.enviro-choice.org.nz.



Doing your own painting

Safety precautions when painting or preparing surfaces for painting:

- Always wear a mask.
- Provide good ventilation, but avoid drafts that will blow dust around.
- Old paint may contain lead or other toxic substances. Dispose of the removed paint as chemical waste.
- Cover all food and wash your hands before you eat. Don't eat, drink or smoke while you are working, or in the working areas.
- Avoid skin contact with paints, cleaners and paint strippers.
- Wash your brushes and containers in the sink, not in the garden where it will drain into the stormwater. If you brush off excess paint onto newspaper there is less to wash off.
- Brush cleaner for oil-based paint can be stored in a jar after use. The paint will settle out and the cleaner can be poured off and reused.
- Leftover paint is hazardous waste: you can take it to the drop-off point at the Waitakere Refuse and Recycling Transfer Station, or see if your supplier has a take-back scheme. Try not to buy more paint than you need.
- Vent painted rooms well before moving back into them. Stay out for 48 hours if you can.
- Use paints with the lowest VOC content possible.

Further information

Advice at the Waitakere City Council:

Phone the call centre (09) 839 0400
Ask for: Cleaner Production
Eco Design Advisor

In print

Some manufacturers have health, safety and environmental care brochures about their products, ask your supplier.

Your Home Technical Manual, Australian Government. Comprehensive printed resource, much of it relevant to New Zealand.

On the web

www.smarterhomes.org.nz is a mine of up-to-date and independent information. Designed for the general public, it's easy to use, has case studies, and includes features such as Homesmarts, a calculator you can use to find information relevant to your needs or simply to run a home-health check.

If there are questions you can't find answers to on Smarterhomes, www.level.org.nz goes into more depth and is aimed at the design and building industries, with drawings and links to Building Code compliance documents.

Check out the independent ecospecifier website knowledge database on paint (www.ecospecifier.org/knowledge_base/setting_priorities/paints). This site sets out the key priorities when choosing paint types, and although Australian, almost all of the data is applicable to NZ.

Eco-building Products and Services Directory, Building Biology and Ecology Institute, phone Auckland (09) 376 6767, Wellington 0800 223 272. This is updated regularly and can be obtained from the website www.ecoprojects.co.nz.

This chapter was last reviewed in September 2008.

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