

Colour Accuracy

COLOUR ACCURACY WHEN TINTING DIFFERENT PAINT TYPES

Major paint manufacturers and suppliers market their own standard colour range. They present their colour range in the form of various colour charts, fan decks, folders or in-store colour chip displays. Each standard colour is formulated for specific products, tinted according to a unique tint formula.

For example, Dulux has the “Dulux Colour Specifier,” which is quite specific to the Dulux Premium decorative brands such as Wash & Wear 101 (gloss, semi gloss low sheen and flat), Aquanamel (gloss and semi gloss) and Weathershield (gloss, semi gloss and low sheen). All these products are “tint strength aligned” which means that the colour will be a Class 1 match if tinted accurately according to the Colour Specifier Formula Book. The Colour Specifier formulae only refer to the Decorama decorative paint tint system, and only for Dulux Premium decorative brands.

There are also standard colour systems, such as British Standard BS 4800 Colours, British Standard BS381C Colours, the European RAL Colours, and the Standards Australia AS 2700 colours.

The AS2700 colour range consists of around 200 standard colours designed for Specifiers to select colours for pipeline identification, line marking, safety demarcation and other engineering purposes. [The AS2700 colour standards are the intellectual property of SAI Global and available from their on-line shop.]

DOES COLOUR VARY WITH GLOSS LEVEL?

Yes, there is a perceived variation in colour between flat, low sheen, semi gloss and gloss surfaces; the glossier a product is, the darker or more saturated the colour appears. This is because at lower gloss levels (i.e. flatter surfaces), light directed onto the surface is scattered to a greater extent, and so the colour appears lighter. To prove this, apply a drop of clear, colourless oil on a flat, coloured surface; it will immediately appear to darken the colour. Oil serves to increase the gloss of the surface and reduce light scatter.

DOES COLOUR VARY WITH DIFFERENT PRODUCTS?

Yes. When a tint formula for a given colour is used in another product or coating technology, the end colour is likely to appear somewhat different. Even if the product was tint-strength aligned to a specific tinter system, slight variations may still occur due to differences in paint formulae.

For example, the same tint formula used in a polyurethane product will result in a very slightly different colour from that an epoxy product of the same gloss level due to different materials present in the formula.

DOES COLOUR VARY WITH LIGHT SOURCE?

Yes. There are two issues to be considered here. Firstly is the subjective impression created by the colour or wavelength of the light source itself. Warmer or yellower light makes colours look warmer, fluorescent lighting generally makes colours look greener.

The second, and perhaps more significant issue when it comes to colour matching is that various colours behave differently under different light sources. That is, two colours may look identical under one type of light and they may look totally different under another light source. This behaviour is called “metamerism”.

The reason for this behaviour is that when we view a colour our eyes are processing reflected light from the coloured object. If the chemical nature and composition of the surface is different, then the way it reflects light will change. The most significant contributor to this effect is the pigment types or chemistry used to make the colour, not so much the paint type. This is most often visible in yellow colours but may occur with others as well. The effect will be that two colours matched on different pigment types may look like a perfect match indoors, under fluorescent or LED lighting, but may look totally different in daylight (or vice versa). This is the result of the different pigment types filtering the light differently as it is reflected from their surface.

Generally most colours are matched in daylight or an artificial simulation of it, as that is where they are generally used. This means that if you want to check the accuracy of a colour match you must do it under similar lighting to which the colours were matched. No point comparing two colours under office lighting if they are both to be used in daylight. Alternatively if a colour is to be exclusively used inside (or under specialised lighting) then the nature of the lighting needs to be explained to the colour matcher.

This can be a problem because there can be a number of different pigment combinations which can achieve a given colour and different paint suppliers may use different pigment types or sources.

WHAT LIGHT SOURCE DOES DULUX USE?

Dulux uses natural daylight to match colours. If a particular colour is to be used on an area of high public scrutiny in artificial light, the colour must be matched using the specified product and under the same type of light source that will be used to illuminate the space.

DOES COLOUR VARY WITH TINTER SYSTEM?

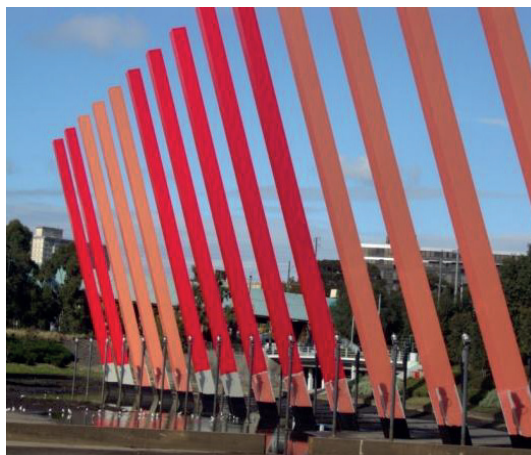
Yes. For example, the Dulux Decorama decorative paint tint system is a specially formulated low VOC tint system that is fully compatible with Dulux Premium decorative brands.

Dulux Protective Coatings products, namely the two-pack solvent borne systems, are only compatible with the Colorfast Tinter System.

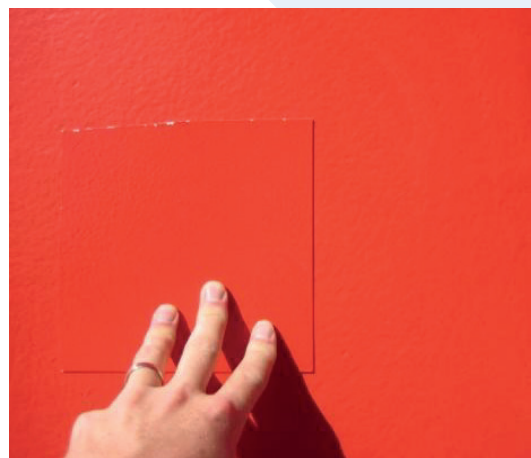
Close colour matches using different types of products and different tinter systems are heavily dependent on the skill of the colour matcher and the specific light source used, however there are certain colours (such as extra clean, bright colours in the Pantone Matching system) that are simply not achievable using paint and tinter.



Colour is delivered by either grinding the coloured pigment into the base paint at manufacturing stage or by adding tinter to the product at point of sale.



Melbourne's CityLink Gateway is a case study in pigment and resin colour stability. The brightly coloured Red Sticks are shown with a high durability polyurethane specially formulated with a new, UV stable red pigment. All the CityLink Gateway red sticks have now been painted in this new Weathermax HBR "CityLink Cherry Red"



After four years exposure, this new formula Weathermax HBR "CityLink Cherry Red" has held up remarkably well, dramatically outperforming previous coatings.

DOES COLOUR VARY WITH RESIN TYPE?

Yes. Most colour systems are based on acrylic latex formulations because most decorative paints are of this type. Coatings based on different resin/binder systems such as vinyl acetates, enamels, epoxies or polyurethanes, can cause wide colour variation. Water borne emulsion paints are also very different from solvent borne paints because in water borne paints the binder is emulsified in water, whereas in solvent borne paints, the binder is dissolved in solvent. Powder coatings differ significantly from liquid coatings, and different powder resins, such as polyesters and fluoropolymers, will also appear different. Single pack and two pack coatings may also differ from each other in colour, even if the resin type is the same.

Coloured pigments and tinters will therefore behave very differently in each. Slight differences in the colour of the resin also affect the final colour of the paint.

DOES COLOUR CHANGE WITH TIME?

Yes. Different resin systems have differing resistance to fading or changing colour with time and with exposure to UV light.

CHALKING AND YELLOWING OF ENAMELS

Enamels are well known to fade and chalk on exterior exposure, especially in dark colours. The darker the colour, the greater the absorption of UV light, and the faster the chalking occurs. The chalky material is also more noticeable on darker colours. Enamels also strongly yellow with aging, particularly if exposed to ammonia (present in common cleaning products). Oddly, enamels yellow if protected from UV, such as behind wall hangings and in door jambs.

CHALKING AND YELLOWING OF EPOXIES

Epoxies are widely known to yellow with time whether exposed to UV or not. On exterior exposure, however, epoxies also chalk, as UV light breaks down the epoxy resin. Yellowing can occur within a few weeks or months of application, but can be accelerated by:

- Insufficient induction time
- High air humidity or condensation
- Hardener – cold cure hardeners yellow faster than standard hardeners
- Exposure to chemicals such as carbon carbon dioxide and ammonia
- Poor air circulation
- Higher film builds

Epoxy coatings provide excellent barrier protection and are therefore specified as primers and intermediate coats. They are also used as topcoats in industrial situations where function is more important than aesthetics. Yellowing can be masked by choosing colours with a yellow tone (eg. greens, yellows, oranges, and browns).

Industrial coating manufacturing processes generally do not manage tint strength as closely as those of decorative products. Steel primers are not colour adjusted, as these are rarely used without a topcoat.

If colour is important, then polyurethane topcoats are essential to provide long term colour and aesthetics.



Freshly mixed zinc phosphate epoxy primer was applied over the same product applied only a couple of weeks earlier. Yellowing is clearly visible. As mentioned in the product's data sheet, this yellowing is expected, but will not detract from the protective properties of the product.

DO FAN DECKS AND SWATCHES FADE?

While colour fan decks are useful tools for choosing colour and very handy for taking to clients or building sites, a specifier must be extremely careful when using them. The pigments used in colour fan decks are highly sensitive to heat and moisture, and should be kept cool and dry, and replaced every couple of years.

To ensure colour accuracy in any Dulux Protective Coatings topcoat, a sample of the specified product in the specified colour must be signed off by the project manager before application of the coating to avoid any colour disputes later. Keep the sample clean, dry and cool. Do not use any other colour sample – use only your agreed and signed off product and colour sample for colour matching.

An acceptable colour match is one where there is no perceived colour difference when the agreed sample is held one finger width away from the painted surface.

MATCHING PAINT COLOURS TO PANTONE®

Pantone® Matching System (PMS) colour is designed for the display of printed colour and is based on pigments used in printing inks. Ink colour pigment systems allow light to pass through the layers of colour inks to construct a colour that is not necessarily opaque. In contrast, paint colour pigments must construct an opaque colour to achieve consistency across the film and not allow underlying colour of the substrate or previous coating to affect the finished colour.

Therefore, due to the different pigment types and underlying opacity difference, it becomes very difficult to match a colour based on printing inks with a paint system. This is particularly the case for bright, strong, saturated colours.



Colour samples in the specified product and signed off by the project manager avoids disputes about expected colour later. Fan decks should not be relied upon for colour checks.