

# Colour Accuracy

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

## DOES COLOUR VARY WITH GLOSS LEVEL?

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.

## DOES COLOUR VARY WITH DIFFERENT PRODUCTS?

When a tint formula for a given colour is used across different coating technologies, 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 formula.

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

## DOES COLOUR VARY WITH LIGHT SOURCE?

There are two issues to be considered here. For example, yellower lighting makes colours look warmer and fluorescent lighting generally makes colours look greener. 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. Therefore, to check the accuracy of a colour match it is recommended that it be done under similar lighting conditions. 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.

## 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?

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.

## DOES COLOUR VARY WITH RESIN TYPE?

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.

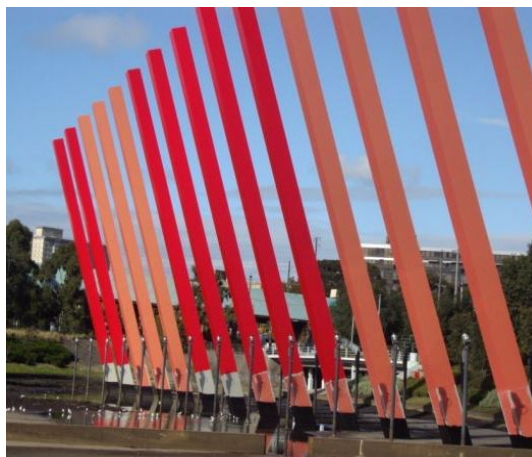
Coloured pigments and tinters will therefore behave very differently in each. Slight differences in the colour of the resin also affect the final colour of the paint.

## DOES COLOUR CHANGE WITH TIME?

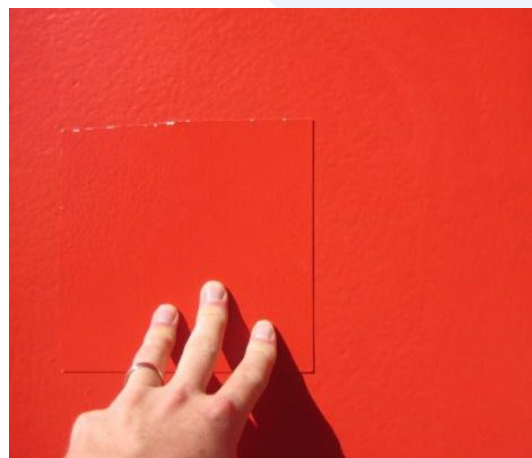
Different resin systems have differing resistance to fading or changing colour with time and with exposure to UV light. Different colours have differing light stability. Whites have the greatest stability to UV degradation where deep hue colours (especially reds and yellows) are traditionally the most UV sensitive and therefore fade more readily.



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.

## CHALKING AND YELLOWING OF ENAMELS

Enamels are 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. Enamels also are susceptible to yellowing with aging, particularly if exposed to ammonia (present in common cleaning products).

## CHALKING AND YELLOWING OF EPOXIES

Epoxies are 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).

## HOW DOES OPACITY IMPACT COLOUR

Opacity determines the ability of a coating film to mask the underlying substrate. In most cases, darker colours such as black & dark greys generally deliver coverage in fewer coats compared to vibrant colours such as yellows, oranges & reds that may require multiple coats to achieve optimal coverage.

The opacity of deep hue colours (especially yellows, oranges, reds) can be relatively poor as large quantities of tinter is added to either a clear or extra bright base. There is no pigmentation within these bases and opacity is derived solely from the tinter. The issue with opacity may arise due to the limitations of the volume of tinter that can be added to the base product. For this reason, when available, Factory Packed colours should be considered as they may offer improved opacity.

The pigment concentration and filler particles within the coating are key to achieving the ideal optical properties for the coating's intended purpose. The pigment and filler particles vary across products, impacting the number of coats required to achieve the desired opacity.

Furthermore, uniform application of all paint coatings with the correct tools and at the specified spreading rate is critical as it helps to achieve acceptable coverage and opacity levels. The specific film build properties of a product also impacts opacity.



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?

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.

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.