



## **Colour for paints and coatings**

### Introduction

Coatings are used for the protection and decoration of buildings, structures, vehicles and articles. Coatings are applied to various substrates including wood, plastic, metal, and building materials. Colour accuracy, consistency, and ensuring the correct specification and colour shade is selected, are of prime importance to coatings manufacturers, coatings applicators and end customers.

It is possible for colour differences to be perceived on the final coated substrate for a number of reasons, some of which may be unavoidable due to the coating and application technology. Colour variations can be caused by a number of factors including different substrate, film thickness, gloss level, angle of viewing, smoothness of film, application and drying method, application and paint conditions, and lighting type.

Applied coatings may differ in colour from an agreed standard; in addition, there may be batch to batch variations. The magnitude of any perceptible difference between two colour tones may or may not be acceptable to the customer. A colour tolerance value nominally acceptable on paper can give rise to a distinctly appreciable colour deviation due to how humans visually perceive colour.

It should be noted that coatings are industrially-manufactured products and, as such, are subject to inherent deviations owing to their industrially-manufactured raw materials and their preparation processes.

Metallic and effect shades (e.g. aluminised or pearlescent finishes) are very complex with regard to colour and so are not included in this guidance document.

### Colour appearance

Colour appearance can be influenced by a number of variables. One of the most important of these is the light source. Apparently similar colours formulated using different colourants can appear very different when viewed under different lighting conditions. This is known as metamerism. Certain colours can be more prone to metamerism than others. To minimise the potential for metamerism, the aim should be to use, where possible, the same choice and combination of colourants to those used in the original colour, and no more than four colourants. Coating manufacturers rely on light boxes with specified lighting sources included, to standardise the colour comparison procedure e.g. D65 (artificial daylight), CIE Illuminant A (tungsten filament light), TL84 (fluorescent light). It is vital to ensure these are well maintained.



## Colour and Light

Colour is a function of light and the perceived colour can depend on the substrate, the thickness of the paint, angle of viewing, perception of the viewer etc. The method of application can also affect the observed colour, paint applied by brush can appear to be a different colour to paint applied by roller. (Note coloured furnishings in a room can also affect the perceived colour).

Additionally, the colour seen in daylight can differ to that seen in artificial light (this is known as metamerism). Therefore, it is important that the colour is checked in the normal lighting conditions that will prevail for the particular coated substrate. For these reasons 'touch ups' should always use paint from the original container.

Any colour differences will be most noticeable with high sheen (high gloss) deeper shades, and therefore touch ups could result in the need to completely repaint the area and not just touch it up.

Many factors affect how interior paint colours are perceived, but the two most common are light and sheen. Sunlight, artificial light, shadows, surface texture and even reflections from other surfaces all affect colours on interior painted walls.

"The room you painted for me isn't the right colour. It doesn't look anything like the paint chip I picked."

Why does my room look like it's painted two different colours?

Without light, there is no colour.

How a colour is perceived is affected by a number of factors, but when it's on interior walls, the two most common factors are light and sheen.

### The impact of sunlight

Sunlight is the purest light and provides the purest colour from the spectrum standpoint of the perception of colour, But sunlight changes over time. As the day progresses and the earth rotates, the intensity of the light changes and you'll observe changes in the appearance of colour.

The way sunlight varies through the day is pretty obvious. Photographers are very aware of this and often seek to take their photos during certain parts of the day to make best use of these effects. The same applies to paint colour. What may look great at 7 a.m. may look different at 4 p.m.; it's related to the intensity of the sunshine and the shadowing.



In the morning, sunlight is warmer because it's lower on the horizon. It will give a yellowish cast to your space, but, because of the imparted extra warmth, colour is often its most beautiful in the morning.

As the day progresses to midday, sunlight develops a cool, bluish cast. It is an interesting paradox that the physically hottest sunlight imparts the least 'warmth' to colour. The hottest colour temperature (measured in Kelvin units) is blue — off the top end of the visible scale to ultraviolet — and the coolest is red — off the low end to infrared.

At midday, especially in areas that receive direct sunlight, colour can appear washed out. As the afternoon wears on towards sunset, daylight again warms with a reddish cast. Homeowners and painting contractors experience this every day, but it doesn't become a top-of-mind topic until you're painting. There are seasonal changes that affect sunlight, too. Winter sunlight is a bit more on the cooler, blue side than summer sunlight.

### Artificial light's effects

In residential and commercial spaces, artificial lighting is frequently used to either supplement daylight or replace it entirely. The type of artificial lighting plays a large role in how a colour looks.

The kinds of typical artificial lighting most commonly used in residential and commercial spaces include incandescent, fluorescent and halogen. The effects of these artificial lighting sources can make certain colour choices winners or losers.

Incandescent and halogen lighting tends to warm up reds and yellows because the wave lengths of these artificial lights are warm. So, if you have incandescent light and you want blue walls, you might have to make adjustments, such as selecting a value that is a blue toned with red. Fluorescent light, on the other hand, is very cool lighting. It tends to enhance blues and greens, so, a blue or green paint will appear better with fluorescent lighting.

### Shadow effects

When you remove light or tone it down, there is a different effect on the perception of colour. In areas where there is shadow, colour would never look bright or vibrant, because the colour of the paint never has a chance to jump out. Light waves can't play off the pigments in the paint, But there may be times when this is an important consideration. In a softer-lit area you may be able to see the colour better than in a stronger-lit area.



## Combinations at play

In the real world, there isn't just one kind of light at play, you typically have a combination. If there are large windows, it likely will be a combination of a lot of daylight, some artificial light and some shadows. With small windows, you may have the effects of only a little daylight, primarily artificial light and some shadows. But there's more to consider! You may have a southern exposure, with more direct daylight effects; a northern exposure, with mostly indirect daylight; an eastern exposure, with a lot of morning sun; or a western exposure, with mostly afternoon sun. Northern and western exposures provide cooler, bluish tones. Southern and eastern exposures are warmer, more yellow.

Adding gloss to the mix. Flat, eggshell, satin, semi-gloss and gloss. Often the choice in sheen has to do with durability and hiding power, but it also affects the perception of colour. As a rule, higher gloss paints tend to look brighter. Much like wetting something with water, a high-gloss sheen enriches colour. Gloss often enhances and creates more body and richness to a colour. If you have a duller sheen, the colour is flatter. However, this isn't always the effect you want on walls.

With high sheen you may have problems with glare; the result of harsh lighting. If you have a sheen that's reflecting light, it's not always as decorative or pleasing. On the other hand with a flat sheen you don't get the exaggeration you might experience with a gloss. From a decorative standpoint, duller sheens are preferable on some surfaces, such as walls, as opposed to stand out, such as a mantelpiece.