

TECHNICAL ADVICE

# PERFORMANCE

## Opacity of whites



# PERFORMANCE

## Opacity of whites

### What

#### What is opacity?

“Opacity” is the term most commonly used to describe the ability of the paint to obliterate the colour difference of a substrate. (Ref: AS/NZS 2310 – Glossary of Paint and Painting Terms)

A fairly well known but commonly misunderstood fact is that the opacity of “off-white” colours, tinted from a white base with relatively small levels of yellow or bright red tinter, is compromised when compared to the untinted white base.



### Why

The **opacity** or **hiding power** of a paint film is dependent upon the pigments ability to both scatter and absorb light.

Scattering of light is dependent on the pigments “refractive index” – the higher the refractive index, the greater the light scattering hence the better the opacity.

Titanium Dioxide, the white pigment used in paint, absorbs very little light but has a relatively high refractive index and for this reason it is widely used in paints to give excellent opacity.

On the other hand, black pigments absorb almost all light and therefore have excellent opacity. The more light the pigment absorbs, the better the opacity or hiding power becomes.

It is important to note that refractive index is not a fixed property, but in fact varies with the wavelength of light. At the blue end of the visible spectrum the refractive index is at its highest point and therefore opacity is at its maximum. Conversely, at the yellow and red end of the visible spectrum the refractive index is at its lowest point and therefore opacity is at a minimum. This accounts for the lower opacity of yellow and red toned whites compared to blue or grey toned whites.

### How does it occur

The addition of a small amount of yellow (DD), ochre (EE) or bright red (LL) tinter to a white base will actually reduce the refractive index and therefore adversely affect the opacity. This drop in opacity is not very large but it could be enough to generate the need for additional coat(s) in order to achieve full coverage, depending upon product, application conditions and technique.

The addition of larger quantities of these same tinters will however increase the opacity as the colour intensity increases when it begins to absorb more light and this takes over from the scattering influence.

### Solution

The selection of “high opacity white” colours that contain black (M) and/or blue (B) tinters will provide excellent opacity, even if some yellow or red tinter is also present. The half and quarter strength versions of these colours will generally also exhibit very good opacity.

The opacity also depends on the overall concentration of pigment in the paint hence darker shades will generally exhibit superior opacity.

## PERFORMANCE

### Opacity of whites

**Prevention** There is a likely misinformed belief within the building industry that all colours will obliterate the substrate in two coats of topcoat and that colour choice does not affect the opacity of architectural or decorative coatings.

In fact, choice of colour does have a direct bearing on the *opacity* or *hiding power* of the paint and unless managed correctly, opacity problems can also affect the tone of a colour, so that the desired shade is not actually obtained.

With colours that exhibit less than perfect opacity, it is even more important for full and complete obliteration of the substrate or background colour to be achieved.

Tinted Undercoats should be avoided as they will alter the true colour of the white topcoat. The undercoat needs to be untinted white.

**To achieve the best possible results, a three coat system (one coat of prepcoat followed by two coats of topcoat) is necessary**, in accordance with the guidelines contained within AS/NZS 2311(2009) "Guide to the Painting of Buildings".

The use of "high opacity whites" will minimise opacity problems on most uniform substrates. The table below provides a list of some of the most popular *Dulux* whites that will provide excellent *hiding power*, when applied in accordance with the specification.

Dulux® Colour	Tint Strength
Ōkārito	Full Strength
Mt Aspiring	Full, ½ & ¼ strength
St Clair	Full, ½ & ¼ strength
Sandrock Bluff	Full, ½ & ¼ strength
Waiau Bay	Full, ½ & ¼ strength
Hakataramea	Full Strength
Remuera	Full Strength
Mason Bay	Full, ½ & ¼ strength
Ōpononi	Full Strength
Haast	Full, ½ & ¼ strength

# PERFORMANCE

## Opacity of whites

Warning: The *Dulux* colours listed below will exhibit poorer Opacity than those listed above, as they contain only yellow and/or red tinter at very low levels. It is therefore reasonable to assume that additional coats of standard topcoat may be required to achieve full coverage, however opacity is affected by other factors such as spreading rate, surface porosity, colour of the previous coating or substrate and insufficient drying between coats which will also need to be taken into consideration.

White Opal	Cottontail	Champagne Springs Quarter
White Birch	Sarah's Place	Little Manly Double
White Watsonia	Fair Bianca	Off White
Napkin White	Lamarque	Silverdale

Note: The half and quarter strength variants in larger sizes will perform in a similar manner for opacity.

The introduction of high solids, high tint-strength products such as *Dulux Wash&Wear*<sup>®</sup> +Plus Super Hide and *Dulux Weathershield*<sup>®</sup> Super Hide provides a high opacity tint-base for the poorer opacity colours and for situations where very light colours need to be applied over very dark existing colours.

These products have 60% more prime pigment in the formula hence its substrate obliteration capability is superb however it is important to remember that the *Dulux* recommended system remains two coats minimum over existing sound paintwork and over suitably prep-coated new substrate.

**References** A detailed explanation and recommended processes can be found in the Australian Standard AS/NZS 2311 "The Painting of Buildings" Sections 1.8.

Information titled "Opacity of Paints" can be obtained through the Master Painters Association (MPA).  
Phone: 04 472 5870 or Email: [nationaloffice@masterpainters.co.nz](mailto:nationaloffice@masterpainters.co.nz)

Further information can also be obtained from the New Zealand Paint Manufacturers Association Inc.  
Phone: +64 9 910 0141, Email: [admin@paintman.org.nz](mailto:admin@paintman.org.nz)  
Website: [www.paintman.org.nz](http://www.paintman.org.nz)

**Worth doing, worth Dulux.<sup>®</sup>**

**Dulux<sup>®</sup>**

150 Hutt Park Road Gracefield  
Lower Hutt 5010 New Zealand  
0800 800 424  
[www.dulux.co.nz/applicator](http://www.dulux.co.nz/applicator)  
[www.dulux.co.nz/specifier](http://www.dulux.co.nz/specifier)

Dulux, Worth doing and worth Dulux are registered trade marks of DuluxGroup (Australia) Pty Ltd