

# Architectural Coatings – Goodbye to dreary

White houses with blue roofs, that is the popular image of the Greek island Santorin. But nowadays architectural coatings are not only offered in “white”, but in a wide range of colors and nuances to satisfy everybody’s taste. Nevertheless, besides their decorative purpose, architectural coatings must provide certain durable and protective functions to interior and exterior surfaces. In order to comply with important quality criteria and guarantee consistency, a routine quality control system needs to be established.



As architectural coatings are used to paint buildings and homes, they are utilized by professionals as well as do-it-yourself painters. Professionals tend to be more sensitive to application characteristics, whereas homeowners simply paint the wall with the new color but still want the paint to resist color and gloss changes with aging or abrasion.

## Determination of hiding properties

Opacity is an important property of architectural paint. One coat hiding reduces labor costs of a paint job and is a competitive advantage in promoting paints to professionals.

For quick visual assessments of opacity the paint is very often applied on black & white checkerboard charts by roller or brush. In order to achieve objective and reliable data reflectance measurements are done with a spectrophotometer.

## BYK-Gardner Solution



**Solid Color & Gloss**  
spectro2guide



**Automatic Film Applicator**  
byko-drive

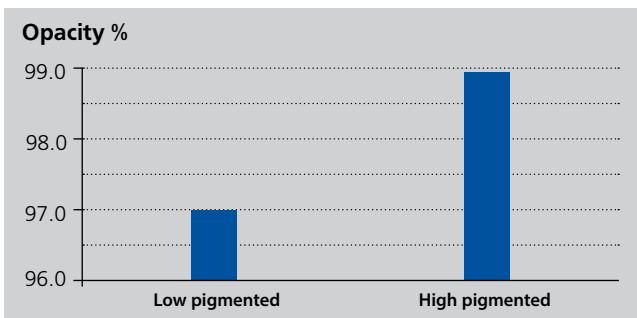
Opacity is the ability of a finish to hide the substrate below. It is also referred to as contrast ratio or hiding power. Contrast ratio is defined as the ratio of the reflectance of a film being applied on a black substrate to that of an identical film on a white substrate. Opacity (%) is simply the contrast ratio multiplied by 100 to get a percentage value.

$$\text{Opacity (\%)} = \frac{Y_{\text{black}}}{Y_{\text{white}}} \times 100\%$$

To ensure a smooth and homogeneous surface, the paint is applied to opacity drawdown charts with an automatic film applicator. The charts are made of black and white areas that are large enough to be measured with color instruments having a d/8 measuring geometry. After being dried for at least 24 hours the average of three readings are to be taken on the black as well as the white area.

When using the spectro2guide the opacity value is automatically calculated and displayed on the instrument. Dependent on the results, the coating systems are ranked in four different classes.

Classes	Opacity	Judgment
Class 1	≥ 99.5	Excellent hiding
Class 2	≥ 98.0 % and < 99.5 %	Good hiding
Class 3	≥ 95.0 % and < 98.0 %	
Class 5	< 95.0 %	



In the graph above two differently pigmented wall paints are evaluated. They are applied with 200 µm film thickness. The lower pigmented system shows a significant lower opacity than the higher pigmented paint.

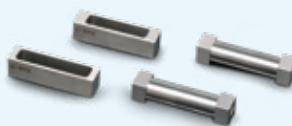
As opacity checks are frequently done it is very important to ensure that the drawdown charts below the paint film are highly consistent in color and gloss. The use of byko-charts drawdown charts guarantees tightest tolerances and prevent erroneous paint batch rejections.

### References

- ISO/DIS 18314-2** Analytical Colorimetry: Saunderson correction, Tinting Strength, Hiding Power
- ISO 6504** Determination of Hiding Power



**Drawdown Test Charts**  
byko-charts



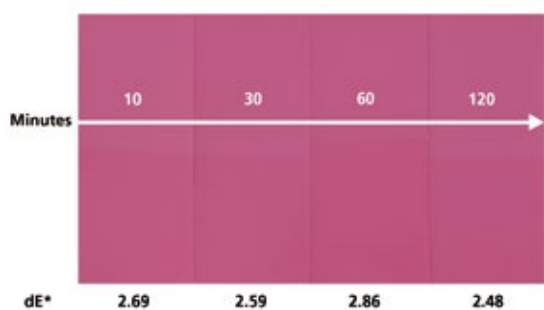
**Applicators**  
Bar applicatos

### Colorant Compatibility

A colorant sometimes fails to disperse completely in a base paint due to poor compatibility, which can be the fault of the colorant, the paint, or both. This will result in poor color development and can be mainly noticed when high shear forces are applied e.g. application by paintbrush. If there is the tendency for a dark colorant to agglomerate (flocculate) in a paint system, the higher shear application forces the pigments to de-agglomerate resulting in a darker appearance of the color.

A quick test is the so called "rub-up" test. A drawdown with uniform thickness is made on a test-chart. After allowing the paint to dry for a certain time a gentle rubbing action with the finger applies stress to one area of the coating. This tends to disperse the colorants and produces a color difference between the un-sheared and sheared areas of the paint film.

The difference can be measured with the spectro2guide using the total color difference value  $dE^*$ : The smaller the  $dE^*$  value the better the color development and vice versa.



In the above picture a paint system was dispersed from 10 to 120 minutes. The  $dE^*$  between before and after rub-up is pretty large which means that the pigments tend to flocculate. The use of an additive can improve the stability of the paint system. ASTM D5326 describes a more sophisticated procedure with better reproducibility than the finger rub-out.



### Touch up properties

Touch up is the ability of paint to maintain its original appearance when a small area is re-painted with the same paint after the original coat has dried. Small imperfections are often found during inspection of a newly painted wall and it is much less costly if these areas can be touched up instead of having to repaint the entire surface. ASTM D3928 Standard Test Method describes a visual assessment rating for touch up properties. Excellent rating means that there is no noticeable variation in gloss between the touched up and non-touched up area on the panel. A rating of very poor represents a great variation.

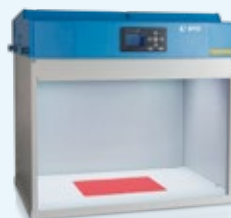
Rating ASTM D3928	Score
Excellent	10
Very good	8
Good	6
Fair	4
Poor	2
Very poor	0

The micro-gloss offers an objective way to measure matte to semi-gloss architectural coatings by using the 85° and 60° gloss geometry. The gloss meter can therefore give a clear differentiation between the touched up and non-touched up areas and helps the paint manufacturer to optimize paint properties.

## BYK-Gardner Solution



Color & Gloss  
spectro2guide



Objective Visual Evaluation  
byko-spectra pro

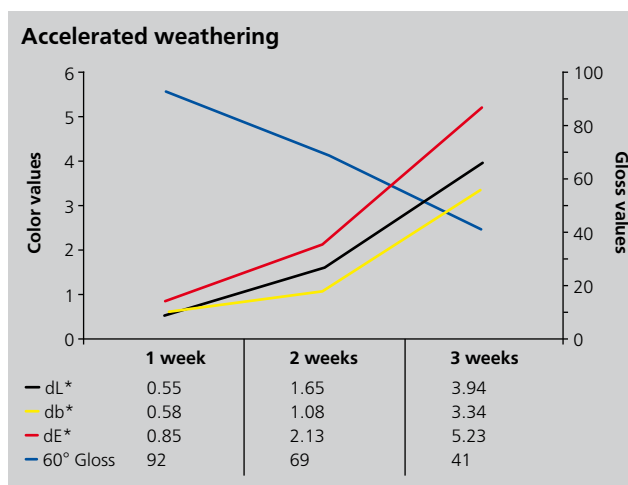


### Weather Stability

Regardless of any environmental influences, color and gloss of interior and exterior walls should remain the same. Weathering studies are routine performance tests to determine durability of paint under extreme weather conditions. The tests are either carried out outside under natural conditions or in the laboratory using accelerated weathering tests. External influences (e.g. solar radiation, moisture, oxygen, and heat) can cause degradation of the colorant and resin. This might lead to changes in color, loss of gloss, embrittlement, flaking, chalking, etc...

Changes in color and gloss are determined by regularly comparing the weathered samples to the original standard. The total color difference  $dE^*$  is usually recorded. Acceptable changes depend greatly on the hue. Brilliant colors tolerate greater deviations than dark and achromatic colors. In order to obtain additional information about the yellowing, often the  $db^*$  is documented. The  $b^*$  value represents the yellow/blue amount, i.e. the greater the deviation on the  $b^*$  value, the more the paint yellowed. UV light absorption can also cause degradation of the bonds of certain polymers used in the paint resulting in a loss of gloss.

spectro2guide is able to measure both color and gloss on the same spot in accordance with international standards.



The above graph shows the results of an extreme accelerated weathering test of a blue architectural coating without UV stabilizer. It is obvious that the  $60^\circ$  gloss value rapidly decreases and the color deviations  $dE^*$ ,  $dL^*$ , and  $db^*$  increase extremely.



**Gloss**  
micro-gloss



**Professional documentation**  
smart-lab Gloss