

TECHNICAL INFORMATION

CEMENT COLOUR AND ITS MEASUREMENT

Illustration
of different
cement
colours



Whilst most people would describe cement as 'Grey', there is a surprising amount of variability in the colour of different cements. There is sometimes a cast, or tinge, to the grey colour, such as grey-green or blue-grey.

The colour of cement depends on a number of factors, including:

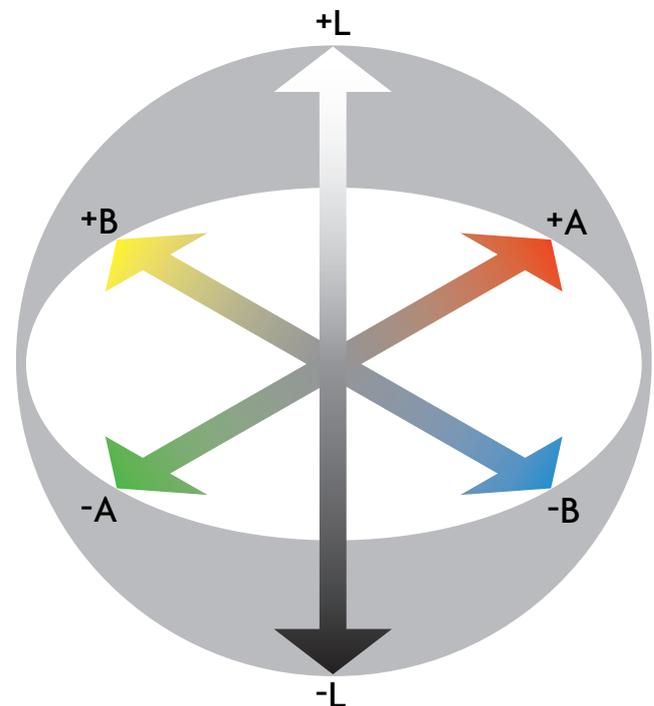
- Raw materials
- Cement mineralogy
- Cement chemistry (including trace elements)
- Kiln operating conditions
- Kiln fuel mix
- Cement fineness

The influence of the naturally occurring raw materials (limestone and clay/shale) is probably the major factor influencing cement colour and its variability.

MEASUREMENT OF COLOUR (L* A* B*)

Colour can be described uniquely in terms of a combination of 3 parameters: L* a* and b*.

- L* Greyness (100 L* = Pure White)
- a* Red (+ve) – Green (-ve)
- b* Yellow (+ve) – Blue (-ve)



The L* a* b* 'colour space'

These parameters are measured using a digital colorimeter, but it is important that the same procedure for preparing the cement sample is followed each time, as the way in which the sample is prepared can exert a significant influence over the measured L* a* b* values.



Using a colorimeter to measure cement colour

COLOUR DIFFERENCES

If the colour of a cement is presented in terms of L* a* b* values, how do we determine whether the difference in these values represents a significant, visible difference?

Given the dominance of the grey colour in cement, a simple measure would be to look at the difference in L* values between two cements. A difference in L* of 2.5 or more would normally be visible.

However, a more complete indication of colour difference is the value of ΔE.

ΔE looks at the differences in all three colour parameters and can thus differentiate between two cements with the same value of L*, but with different colour casts.

For two cements A and B, the value for ΔE is calculated as:

$$\Delta E = \text{Square Root} \{ (L^*_A - L^*_B)^2 + (a^*_A - a^*_B)^2 + (b^*_A - b^*_B)^2 \}$$

It is conventionally thought that the 'Just Noticeable Difference' in colour is represented by a ΔE value of 2.3.

Therefore if the value of ΔE between two cements is greater than 2.3, there will be a visible colour difference. However, it should be noted that, in addition to cement, the colour of sands and aggregates also has a significant influence on the resulting colour of mortar or concrete.

For further information

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