COLOUR AND COLOUR VARIATIONS IN CONCRETE BLOCK PAVING, CONCRETE MASONRY UNITS AND CONCRETE ROOF TILES.

The understanding of colour, hues and reflection of light is complex and a field of specialised study.

This brochure takes a brief look at colour and colour variance in terms of:

1. **The South African National Standard**
2. **Factors influencing colour**
3. **Realistic expectations**
4. **Avoiding disappointment**
5. **Recommendations**

1. South African National Standard Specifications (SANS specifications)

1.1 SANS 1215:2008 Concrete masonry units.

This specification states the following under point 3.1.3 of the standard:

> "When face units are required to have coloured surfaces the colour **shall** be as agreed upon between the manufacturer and the purchaser and the manufacturer shall supply the purchaser for his retention three units of the agreed colour to serve as an example of the **possible range** of such colour."

The standard continues with "Appendix B", highlighting notes for consideration:

> "**B.1** The following requirements must be specified in tender invitations and in each order or contract:
> a) Whether units are to be solid or hollow (see 3.1.1)
> b) In the case of face units, the number of surfaces that are to be suitable for exposed work (see 3.1.2)
> ***c) When required, the colour (see 3.1.3)***
> d) The nominal dimensions (see 3.3)
> e) The nominal compressive strength (see 3.6)
> f) The average drying shrinkage (see 3.7)
> **B.2** The following requirement must be agreed upon between the manufacturer and the purchaser:
> ***When coloured surfaces are required, the colour range (see 3.1.3)***"

Interpreting SANS 1215, your attention is drawn to the following:

- Agreement on colour **shall** be reached between the purchaser and the manufacturer. Upon agreement the manufacturer **shall** supply a purchaser three sample units.
- Hence, if a consultant, architect, engineer, specifier, contractor or whomever acts as middle party between the manufacturer or supplier and client, the obtained coulour sample units should form part of their responsibility.
- **It forms part of the client's responsibility to make sure that these samples are supplied** according to the coulour ranges offered by the manufacturer - the specification calls for agreement on colour to be reached!
- Specific colours can be requested and selected from the manufacturers or suppliers' specific colour ranges, ***to be agreed upon and samples to be obtained,*** before the procurement commences or the contract is awarded.
- The above forms part of the requirements of the specification.

1.2 SANS 1058:2012 Concrete paving blocks.

This specification states the following under point 4.2.3 of the standard:

> "When blocks are required to have coloured wearing surfaces the colour **shall be as agreed** and extend from the exposed surface at least 6 mm into the block.

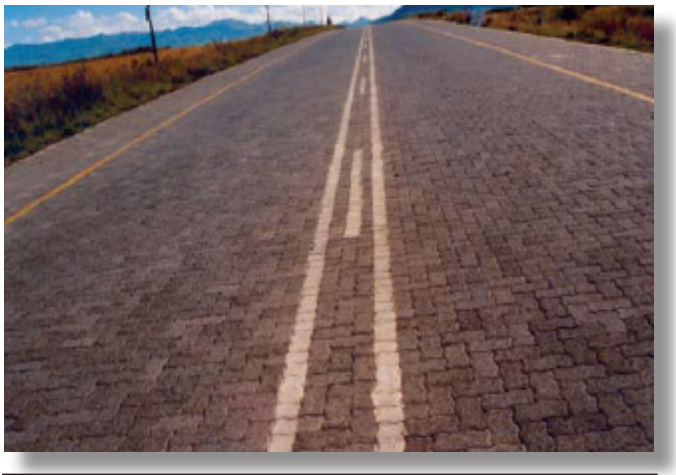
> NOTE: Should the purchaser so require, **the manufacturer should supply** to the purchaser, for his retention, **a sample of three blocks of the agreed colour** and surface texture. This sample serves as a reference sample of the possible range of the colour and surface texture at the time of order."

The standard continues with "Annex A", highlighting notes for consideration:

> "**A.2** The following requirements **shall be agreed upon** between the manufacturer and the purchaser:
> **a) the surface texture and colour (see 4.2);**"

Interpreting SANS 1058, your attention is drawn to the following:

- Agreement on colour **shall** be reached between the purchaser and the manufacturer.
- ***It is the purchaser's responsibility to request a sample*** of three blocks of the agreed colour and surface texture. This will serve as ***reference sample of possible range of colour and texture at the time of the order.***
- Hence, if a consultant, architect, engineer, specifier, contractor or whomever acts as middle party between the manufacturer or supplier and client, the obtained coulour sample units should form part of their responsibility.
- Specific colours can be requested and selected from the manufacturers or suppliers' specific colour ranges, ***to be agreed upon and samples to be obtained,*** before the procurement commences or the contract is awarded.
- The above-mentioned forms part of the requirements of the specification.



Public pavement project with visable variances in hue and reflection

1.3 SANS 542:2020 Concrete roofing tiles.

This specification does not specify any standard in terms of colour.

The standard continues with “Annex B and C”, highlighting **informative** notes for consideration:

“**Annex B**
Surface characteristics
- The actual colour and surface coating should be as agreed upon.
- However, slight colour variations in single colour tiles may occur as a result of the production process.
- Changes in colour and appearance will occur under the influence of natural weathering.

Annex C
Efflorescence
- It appears on the surface of the tile, either as white patches or as an overall lightening in colour, which is often mistakenly interpreted as colour being washed out of the tile.
- Rain and wind gradually remove the deposit, so that the true colour of the tiles is eventually restored.
- Efflorescence is purely superficial and does not affect the durability of the tile, the strength of the concrete, the original colour or the functional properties of the tile.

Interpreting SANS 542, your attention is drawn to the following:

- The actual colour and surface coating ***should be as agreed upon.*** This is not a requirement but forms part of informative information.

Aesthetically pleasing concrete roof tiles.

Conclusion:

Colour variance is normal and to be expected, and provided the South African National Standard is understood and followed there should be no misconceptions about colour variations in concrete pavers, concrete masonry units and concrete roof tiles.

- **The purchaser should endeavour to obtain, and the manufacturer should supply a purchaser three units as sample.**

2. Factors influencing colour

CMA Producer Members produce products in quality-controlled environments with products e packaged and distributed in a manner that ensures precast concrete units are received in the best possible condition.

Colour variation arises from the following:

2.1 Raw manufacturing materials.

Precast concrete units are manufactured from raw materials which may be naturally mined, mechanically produced or derived from recycling. These materials include:

- Cement manufactured from clinker.
- Aggregates - sand and stone
- Water - complying with the requirements of SANS 10100-2.

If these materials have one common feature it is that they always exhibit variances. Materials differ from mine-to-mine with free elements in chemical composition and chemical reactions pre- and post production also playing a role.

- Pigments.

Pigmented precast unit colours cannot fade as the burnt oxides used are an inert product. Variations in colour are due to changes in raw material supply and control of the manufacturing process. For this reason manufacturers implement quality management systems and certify their products to be complient to national standards. Procurement from reputable certified manufacturers guarantee to a great extent that colours will remain constant within a given range of colours within batches of production.

2.2 The nature of concrete

The nature of concrete, its ongoing chemical reaction as well as how and where it is installed influences hues and colour saturation.

This is part of concrete's unique characteristics. These colour variations are normal and don't affect function or quality.

2.3 Environmental and installation factors

From the time the pavers, bricks, blocks, and concrete roof tiles are delivered and unpacked, **environmental and installation factors** will affect their colouring. Sun, rain and, in the case of pavers, the subgrade or base they are placed on, could influence appearance.

Like any other material in an outdoor environment, the appearance of these units might change due to staining, dirt and even due to "tricks" of sunlight including reflections.

3. Realistic expectations

- Colour differences in precast concrete units, coloured with oxides or pigments, or in original concrete colour, are unavoidable.
- Variances can create a sense of appeal and character.
- Without the differences in colour expect monotonous, bland and uninteresting final projects, especially in paving installations.
- Do not expect perfect shade consistency. It is not a characteristic of precast concrete units.

4. Avoiding disappointment

4.1 Apply the South African National Standards and make sure the requirements are met.

4.2 Concrete pavers are not ceramic tiles. Do not expect the finish of a ceramic product.

4.3 Pictures on a website or in a brochure rarely reflect the true product. Make sure to see the actual product!

4.4 Because precast concrete units are made from raw materials, colour variation will occur between pallets. When using multiple pallets, use units from different pallets and mix them when laying.

4.5 The weather during the installation will affect the appearance of precast concrete units, especially pavers. Install units in settled weather, with as little water or rain as possible.

4.6 Ensure pavers are laid so water runs off. The layer work must be free draining to ensure the pavers do not retain constant moisture on the seated surface.

4.7 Efflorescence is caused by a chemical reaction between cement and water. It results in the migration of natural salts to the surface of the precast unit, leaving a whitish powder-like discolouration. Efflorescence will settle and cease over time. The better the quality and strength of the concrete, the greater the efflorescence effect.

4.8 Precast concrete units are porous and will absorb most fluids and other substances. In the case of paving, be careful of jointing sand containing cement as it will affect the appearance of the paving - discuss this with the contractor!

4.9 Precast concrete units should be sealed to prevent discolouration and staining caused by environmental factors. Sealer can also be pigmented to remove some of the colour variances between different batches - discuss the advantages and disadvantages of sealing your pavement with the manufacturer!

4.10 When executing a large project, purchase all your required precast concrete units at the same time. Batches will be closer to each other and colour variations less prominent. You are likely to run into a greater colour variation with batches bought far apart and installed without mixing the palettes.

Single Colours:
Single-colour pavers use only one pigment. When no pigment is used, a natural concrete colour is achieved.
All coloured pavers, either single colours or multi blends, should always be laid from alternated pallets or stacks to avoid patches of different shades. This is also the rule for natural concrete pavers. Allow for breakages and cutting – regular shaped areas at ± 2% of total net area when packed in herringbone pattern and circular cutting at ± 3 – 4 % of circular areas in herringbone pattern.

Monotone paving blocks - every block is more-or-less the same shade

Single colours, especially pale hues, show every mark and stain.

Multi-colours:
These pavers are manufactured using more than one pigment. The blocks may vary significantly. When laying multi-coloured pavers, ensure that different coloured pavers are distributed randomly. This results in a naturally attractive paved area.
When purchasing multi-coloured pavers, follow the three-sample rule bacause there may be vast colour variations in the pavers. However, colour variations allow for interesting designs, and provide vivid eye-cathching contrasts.

Multi-colour paving blocks in three colours - red, tan and charcoal.

Multi-coloured paving is better at hiding stains and dirt and provides eye-catching contrasts.

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CMA Producer Members:

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