

**OTHER INFLUENCES:** Changes in weather conditions affecting temperature, humidity and wind speed throughout the day can influence the load to load setting and hydration characteristics of the delivered concrete. Similarly, the load to load characteristics can be influenced by changes to the ground temperature and moisture content.

Cementitious materials do have a propensity to shrink and possibly crack. Certain types of crack are more prevalent in warm and windy conditions, which can cause the surface to dry rapidly (also see NZRMCA "Cracking in Concrete Floors").

Design considerations such as concrete thickness (recommended minimum is 100mm), design and placement of joints will influence the end product, together with the placement and handling of the concrete on site. The joints can be designed as an architectural feature.

The surface of exposed aggregate concrete can be sealed by the contractor and this can enhance the colour of the finished product.

**CONTRACTORS:** Please talk to your contractor or placer to discuss how the issues discussed in this publication can be managed before commencement of the work. Ask to view some examples of the contractor's work. The NZRMCA supports the Master Concrete Placer's Association ([www.mcpa.co.nz](http://www.mcpa.co.nz))

**Exposed aggregate concrete can look spectacular but care should be taken to ensure the desired finish is achieved. Please be aware however that some natural variability is to be expected.**

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# EXPOSED AGGREGATE CONCRETE

Exposed Aggregate Concrete is an option increasingly chosen by those looking for an attractive alternative approach to driveways, patios, swimming pool surrounds and decorative concrete finishes.

To fully appreciate the old-world charm or striking contemporary looks that can be achieved through the use of exposed aggregate concrete an understanding of the materials and methods that are used to produce the desired effect is helpful.





**COLOUR:** Colour is an architectural tool and can bring a project to life. The desired colour of the finished concrete can be achieved in a number of ways. The most common method is to colour the cement paste (cement and water) using a mineral oxide pigment. Alternatively, a decorative aggregate can be selected for a particular effect.

Mineral pigments can be integrally mixed to highlight the paste and create a mood in keeping with the project's theme. Even though pigments are chemically stable and do not significantly change their hue under normal environmental exposures, all cement-based materials can change their appearance over time. Some changes go virtually unnoticed while others are more conspicuous. Efflorescence for example is a white powdery deposit formed when moisture dissolves salts and carries them to the surface via capillary action.

It should be remembered that these products are natural materials and some colour variation is to be expected during a project.

There are a number of other factors which will affect the visual appeal, such as finishing, local exposure and prevailing lighting conditions.

**EXPOSING THE SURFACE:** The contractor will apply a commercial retarder onto the concrete which will inhibit the ability of the cement paste to set on the applied surface. It can be easily removed after the main body beneath the surface has set. The contractor's experience is vital to the appropriate application of product, timeliness of application and also controlling the variables that can influence the finished project.

**STRENGTH:** The paste, which glues the aggregates and sand together, is a mixture of water and cement. Plain concrete used for drive and pathway applications often has a design strength of 17.5 MPa. As the top surface is removed in exposed aggregate concrete, it is recommended that a design strength of 20 MPa is used. This increase in strength reduces the risk of stone loss from the surface and will not greatly increase the cost of the concrete.

**COARSE AGGREGATE:** Dependant upon availability, NZRMCA concrete suppliers will often use natural rounded coarse aggregate from a number of sources because of its stability in service and appearance. It also produces a less jagged surface. Unlike quarried rock, natural rounded aggregate may contain a range of geological aggregate types, and traces of organic matter. The presence of organic matter may include (but is not limited to) wood or vegetation.

Furthermore, some aggregates contain particles of iron pyrites, which can oxidise to form iron hydroxide, which is brown in colour, and can cause surface staining.

**AIR:** Entrained air is introduced as part of the mix design by the quality assured concrete supplier. Air contributes approximately 4-6% by volume of a concrete mix. However, a further percentage can be entrapped as a result of the mixing process. In most cases the concrete placer expels some of this air as part of the placing process. In traditional trowelled concrete the remaining air is hidden under the hardened smooth surface. With exposed aggregate concretes, the surface paste is removed, revealing the air in the form of tiny 'crater-like' manifestations. This is to be expected.

**ACID ETCHING:** Etching is the process where diluted acid is applied to the concrete to remove excess cement paste from the aggregate. Etching also removes any early whitening, and gives a more uniform appearance over the surface. This can be undertaken as early as three days after the concrete has been poured and up to three weeks later.

Most contractors will include acid etching treatment as part of the contract.

