



Workability, Cohesion, Durability & Strength

- In Concrete

ARMCON
CERTAINTY IN CONCRETE

Workability, Cohesion, Durability & Strength in Concrete:

Top Tips

- When not using admixtures carefully consider the final use of the concrete before deciding on how flowable the mix is to be made.
- Always produce test mixes that contain admixtures to ensure the outcome and how they will behave is known.
- Consider using super or normal plasticisers to reduce slump but keep the durability, cohesion and strength in the concrete.
- Super-plasticiser enables an ease and speed when placing as it produce self levelling concretes to get around difficult forms or congested reinforcement.
- Concrete with super-plasticiser could segregate and bleed but by adjusting the mix to contain 5% more fines (5% less coarse) will help to prevent this problem.

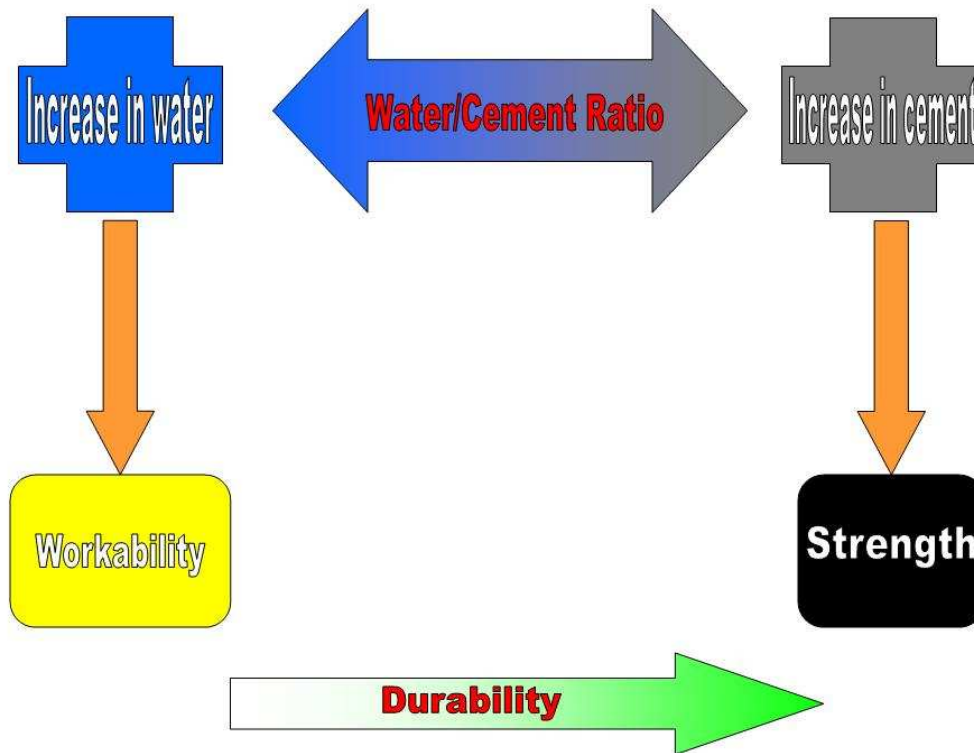
Overview

When producing concrete, the workability, cohesion, durability and strength are all connected. These are the factors that must be considered if quality concrete is to be successfully made.

- Workability means how easy the concrete mix flows in and around the mould or how easy it will move around in large forms.
- Cohesion means how well the mix holds together and its resistance to segregation.
- Durability refers to how well the concrete will perform during its working life, once it has cured fully.
- Strength refers to fully cured concrete and how strong it becomes.

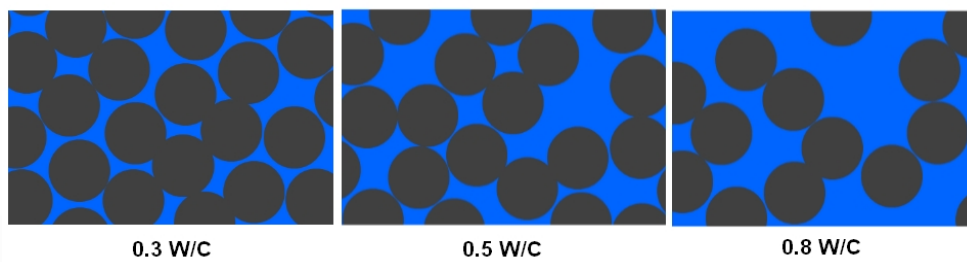
Connecting all these factors together is the water/cement ratio of the concrete mix, this includes the amount of water in the aggregates and the extra water added to the mix.

When extra water is added to a mix the concrete becomes more workable but then becomes less cohesive and a mix with poor cohesion will lose durability and strength.



The flow diagram above shows how all these factors are connected and what changing the water/cement ratio will do to the properties of the concrete.

The less water added to a mix the stronger the concrete should be, however the hydration reaction in concrete requires a minimum of 25 litres of water for each 100 kg of cement which gives us a water/cement ratio of 0.25. In reality a concrete made to the minimum water requirement would be very stiff and would have no water to help lubricate movement (affecting workability), whilst also being very difficult to compact.

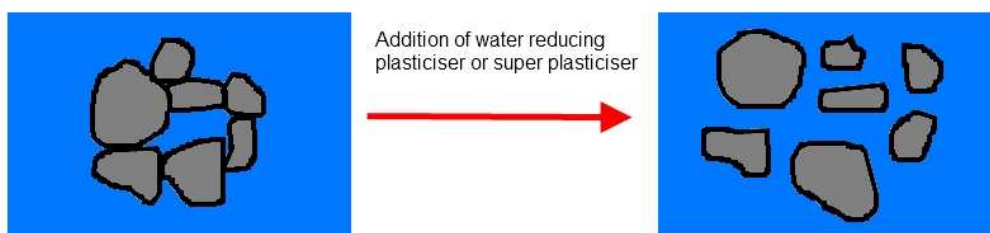


The pictures above show the effects on the spacing between cement particles as the water content is increased and how it becomes easier to move the concrete during placing (it becomes more workable). However as was highlighted previously it comes at the expense of the concrete being durable and reduces the final strength.

Admixture enhancement

Through the addition of admixtures it is now possible to get a workable, cohesive, durable and strong concrete. For this the correct admixture is required and the type of admixture to be used is often referred to as Plasticisers, but they are really water reducing plasticisers or water reducing super plasticisers.

These kinds of admixtures are the most popular admixture sold in the UK and this is because of the enhancements they give to concrete in both production and working life. In general they work by reducing the flocculation (or attraction) that exists between the cement particles in the concrete mix, this means they will reduce the slump of a mix, enable a reduction in the water but maintain cement content & consistence and they can achieve higher strengths with lower cement contents if the water/cement ratio is kept constant.



So with water reducing plasticiser/super plasticisers it is possible to get the benefits of extra water without adding any, which then means the benefits of not adding extra water are also gained.