ARMCON

How to use less cement

– and produce a stronger product

ARMCON
CERTAINTY: IN CONCRETE

CIPA

A MEMBER OF THE CEA Construction Equipment Association

How to use less cement – and produce a stronger product

What is the benefit of reducing your cement content?
In a concrete mix cement is the most expensive ingredient. Reducing cement will mean your production costs will be lowered and margins increased.

How can I reduce the cement content without reducing the quality of my product?
Test the concrete on a regular basis. What strength concrete is required for your product? What strength concrete are you currently providing? Can this be reduced?

The equipment required to produce a single concrete cube in accordance with BS EN 12390-2 is:

- A cube mould, either 100mm or 150mm *(this will be dictated by the coarse aggregate size. Smaller than 20mm in size requires a 100mm mould to be used and between 20 to 40mm needs a 150mm mould)*
- A square compacting bar *(25mm square, 380mm long and weighing 1.8kg)*
- Mould release oil
- Medium sized paint brush
- Metal round mouth scoop
- A metal trowel or float
- Spanner to fit bolts on mould

It is essential that before any cubes are moulded that the mould(s) being used should be taken apart, cleaned completely so that no hardened concrete remains, reassembled correctly and given a thin coat of mould release oil.

When filling cube moulds from a sample of the concrete being tested it should be noted that the sample needs to be at least 1.5 times bigger than the volume of the mould, this is so that there is enough concrete to fill the mould completely and is finished properly.

It is important to fill the mould in equal layers, for a 100mm mould the concrete should be done in two layers and for a 150mm mould it is good practice to fill the mould in 3 layers. After each layer is placed in the mould it needs to be fully compacted so that all entrapped air is removed, but no entrained air is taken out and also without causing segregation of the concrete. Compaction can be done by a hand tamping bar or vibration, if the compaction is done by hand then at least 25 strokes of the tamping bar should be applied to the concrete layer that has just been placed and to complete the hand tamping method a mallet is used to tap the side of the mould, which will remove large air bubbles and level out depressions in the surface.

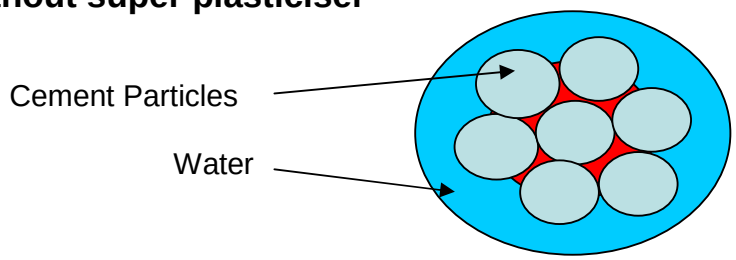
When the final layer is fully compacted the concrete should be finished flat and level with the top of the mould, this is done by using a steel trowel or a float. With the cube starting to cure it will need placing in room temperature (about 21 ^{0}C); protected from dehydration and vibration, the surface of the concrete will also need covering with either a sheet of polythene or damp sack type material. After an initial cure of 24 hours it should be possible to de-mould the test cube and place it in a temperature controlled water tank for the required time before it is tested for compressive strength.

Additives

Super plasticiser will improve quality, strength, profitability and consistency. Used in the correct way it will always be cost positive and show a measurable improvement in profitability.

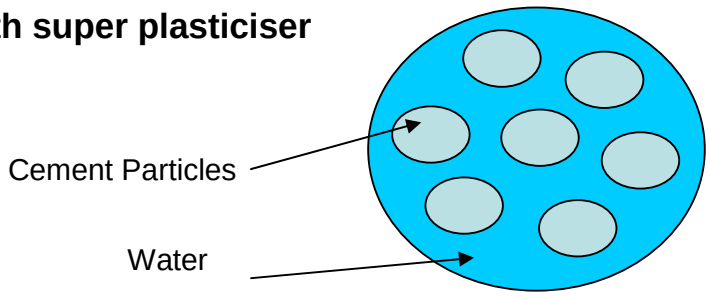
Super plasticiser offers a number of significant benefits to the pre-caster and one of the most important is the ability to reduce cement contents.

Without super plasticiser



Here we see the cement particles do not disperse and are only partly wetted when they mix with the water. As you can see the red area has no water/cement contact at all and will not fully hydrate the cement.

With super plasticiser



With the addition of super plasticiser the cement particles are dispersed allowing the water to coat the whole of each particle ensuring complete hydration resulting in increased concrete strength