



The Effect of Excess Water in Concrete

Nothing is easier than adding excess mixing water to premixed concrete at building sites. And nothing is more likely to reduce the strength of the concrete, or make repairs to a concrete construction necessary, or more likely to damage a contractor's reputation for efficiency and reliability.

Concrete supplied by READYMIX is carefully proportioned and mixed to produce strength according to specifications. Less than half the water it contains is needed for the hydration of cement. The rest of the water is there to make transporting and workability easier (by providing lubrication between sand/aggregate particles) and to ensure that there will be sufficient inherent water for the curing process.

The plant supplying the mix will adjust the water content fractionally to meet summer or winter conditions of transporting and placing.

"Wetness" of concrete as measured by the slump test is directly related to its compressive strength - the 28 day compressive strength of concrete is reduced by about 1.5 Mpa for each additional 20mm of slump produced by adding water.

To put this another way, each additional 10 litres of water per cubic metre will reduce the strength of concrete by about 2.5 Mpa.

Unless extreme conditions make it necessary, site supervisors should not permit water to be added to premixed concrete without their approval.

The ever present site problem is that all members placing teams quickly learn about the labour saving effect that "a little" added water has on workability of concrete.

The site supervisor can't tie knots in the hose(s) needed for cleaning equipment so 'a little' water may be added to concrete during a pour.

With this unofficial system operating it doesn't take long to add 100 litres of water to a truck load say (5m³) of mixed concrete. The effects will be (a) an average increase of about 80mm of slump over the slump specified, (b) an average reduction in compressive strength of about 5 Mpa and (c) uneven strength throughout the concrete mass comprising a number of truck loads with varying slumps.

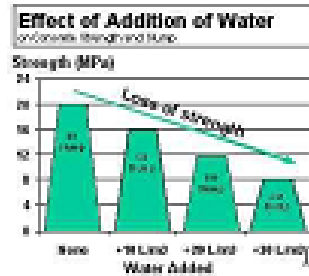
The only answer is to make at least one responsible member of each placing team fully aware of the harm excess water can cause.

Perhaps the most dangerous of all practices is the use of extra water to help concrete "flow" along elevated forms to lower points. In this case, if shores/toms are removed after a normal curing period, severe structural cracking and/or collapse are more than possibilities.

Effects of too much mixing water

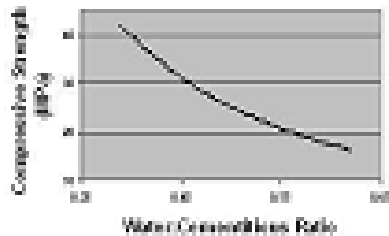
Whilst adding water will in some cases facilitate easier placing, the disadvantages of this include the following:-

- Lower compressive strengths
- Segregation of the concrete mix under certain conditions resulting in variable quality throughout the concrete mass.
- Cracking - with too much water, there will be lower tensile strength, and a tendency towards high shrinkage and subsequent cracking.
- Dusting and scaling - Bleeding of excess water brings too many fines to the surface of floors
- Sand streaks. Excess water bleeding up the sides of forms washes out cement paste and leaves an unsightly streaked surface.
- Contamination. Too much water in concrete placed on grades causes contamination from the subgrade with the concrete leading to an array of quality problems
- Permeability. Voids left as excess water evaporates invite water to seep through walls and floors
- Dead losses - costly repairs, or in extreme cases, demolition and re-building at contractor's expense.



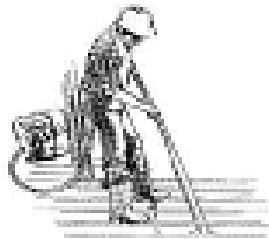
Approximate compressive strengths for given water-cementations ratios are shown below. Cementations binder needs less than half its own weight of water to turn concrete into durable construction material.

The 'wetter' this cementations paste is, the weaker it is. The chart below shows how strength decreases as water content of a mix increases.

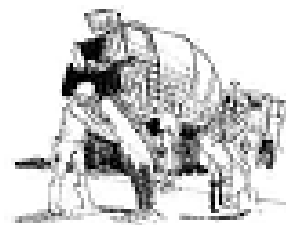


Four ways to minimise temptation to add excess water

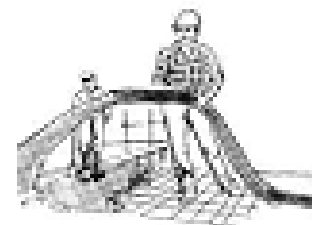
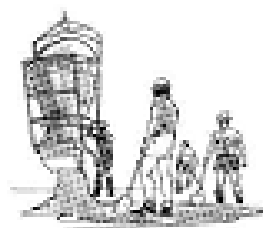
Be ready to accept premixed concrete as it arrives. Prolonged mixing in the truck agitator makes concrete stiffer, and harder to work.



Where high slump concrete or special placement conditions exist consult READYMIX Technical staff for advice about mix designs.



All concrete requires proper compaction using correct equipment and techniques.



Make sure that enough men are available on site to transport, place, compact and finish fresh concrete.