

TIP NO. 4



Quantum Readymix Concrete

ADMIXTURES AND THE RETARDATION OF CONCRETE

Our technical Information topic this quarter deals with the vexing issue of the extended setting of concrete which can be a fearful subject at the best of times. There is nothing worse than coming to the site the day after casting and clearly the concrete hasn't set.

It has been said that the removal of a single cubic metre of concrete (hardened) can cost as much as placing the next 200 cubic metres and contractors generally take the view that it is best to take the concrete out whilst it is still in a plastic state as clearly something has gone dastardly wrong and better safe than sorry. When one considers that the yardstick for final set is 10 hours ones concerns under such circumstances are valid.

The retardation of concrete which happens more in winter than in summer can occur for many reasons, but these are the most common, namely;

- **Adverse winter conditions, one generally shouldn't place concrete when temperatures are less than 5 degrees and dropping.**
- **Extensive use of extenders. The relationship between the class of cement, its gypsum content (normally 3% -5%) and the extender i.e. fly ash MGBS is critical to the setting time.**

- **Overdosing of admixtures.**
- **Mixing water; with RMC companies having to deal with the supply of water from inept municipalities, boreholes, recycled water etc. it is becoming more and more of a factor. It would be a brave concrete company that would consistently use river water from any source in Gauteng today and algae is**

The use of admixtures as well as extenders has become so commonplace today that one cannot imagine RMC companies surviving without their usage. To this end we have in collaboration with Concrete Testing Services done an exercise on the overdosing and gross overdosing of admixtures in concrete.

Very often the cause of overdosing of the concrete is clearly visible and more often than not one can actually smell the admixture which has distinctive smells. If one can determine that all else is well and overdosing is in fact the problem, the following exercise serves as a guideline as to how extensive the problem may be and what one's options are. If one can live with a higher drying shrinkage, then crushing cubes at 3 days and thereafter will give clearer answers.

In the exercise overleaf where we produced a 30Mpa concrete, using 30% fly ash with a Cem II 42,5 and a dosage rate of up to 4% admixture (when recommended dosages are between 0,3%-0,7%) the 28-day result was still achieved even though it had not yet set after 3 days. At higher rates of overdosing, whilst the 28-day result was progressively more effected they improved significantly at 56 & 90 days.



MIX DESIGN		DRY MASS Kg/m ³	
Afrisam Cem II 42.5R		210	
Ulula Fly Ash NFA		90	
Dolomite Crusher Sand Ex Afrisam		765	
Filler Sand		180	
22mm Dolerite		1010	
ADMIXTURE CHRYSO 122		VARYING DOSAGES	

Mix No	ADMIXTURE DOSAGE	SLUMP MM	STRENGTH Mpa					COMMENTS
			3DAY	7DAY	28DAY	56DAY	90DAY	
01	0.5%	60	18.0	26.0	39.5	46.0	54.5	As Expected - Recommended Range
02	1.0%	130	21.0	28.0	40.0	48.5	58.0	As Expected - Recommended Range
03	2.0% (2x+)	Collapse	16.5	30.5	37.0	45.5	55.5	Higher slump 28-day strength acceptable
04	3.0% (2X+)	Flow =565mm	**	24.5	37.0	42.0	50.0	As time goes on strength recovers ground progressively
05	4.0% (2X+)	Segregation	**	3.0	31.5	40.5	47.5	As time goes on strength recovers ground progressively

Concrete not sufficiently set, cubes could not be stripped under lab conditions. Ambient temperatures.
2x+ = minimum double overdose

OBSERVATIONS

As difficult as it may be to accept that the setting time and 28-day strength of concrete is two separate issues it is so. If the setting time of concrete is as expected that does not necessarily mean that the 28-day strength will meet it criteria and vise-versa. In this case we have grossly overdosed the admixture and shrinkage aside, in even the worst-case scenario, the strength is eventually attained. This can in part be attributed to the fly ash as it is known that no other extender enhances post 28-day strength development as fly ash does and virtually all concrete cast these days contains fly ash.