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Loss of Workability of Superplasticized Concrete in High Rise Construction

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Summary

In the construction of high rise buildings, sometimes it may so happen that the superplasticized concrete which is mixed may have to wait for a longer time before entering the form, either due to some machinary/pump failure or due to some dispute. If this superplasticized concrete is kept for a longer time, it will loose its workability. To increase the workability, one more dosage of superplasticizer may have to be applied just before the pouring of this concrete into the forms. Thus the application of repeated dosages of superplasticizers become important in such circumstances. Thus the application of repeated dosages of superplasticizer is one of the solutions for counteracting the loss of workability. This paper presents the results of an experimental investigation carried out on the effect of repeated dosages of superplasticizers on the properties of concrete produced from 43 grade & 53 grade cements.

1. Experimental Work

The primary aim of this experimental programme was to study the effect of repeated dosges of superplasticizers on the properties of fresh and hardened concrete produced from 43 grade & 53 grade cements and hence to know how many repeated dosages of superplasticizers can be applied without sacrificing the strength & workability properties of concrete.

The tests were conducted on a mix of proportion 1:2:4 with a w/c ratio of 0.40. Two superplasticizers with their recommended dosages as follows were used in the experimentation.

Conplast 430 - 0.5 %
Zentrament Super BV - 0.5 %

2. Experimental Results

Table 1 - Shows the effect of repeated dosages of Conplast 430 & Zentrament Super BV on the properties of concrete produced from 43 grade & 53 grade cement.

Table - 1 Results of repeated dosage application.

Particulars of concrete	Dosages of superpla - sticizer	Slump (mm)		% flow		V.B. Degree (Sec)		Avg. Density (N/cum	Avg. Compressive Stg. (MPa)	Avg. Flexural Stg. (MPa)
		Before Dosage	After Dosage	Before Dosage	After Dosage	Before Dosage	After Dosage			
Concrete produced from 43 grade cement with Conplast 430	No Dosage (after 0 min)	-	20	-	1.5	-	80	26890	19.89	8.00
	1st Dosage(after 30 min)	14	80	1.3	4.2	98	45	27960	29.56	8.40
	2nd Dosage (after 60 min)	13	85	1.3	4.5	105	42	28070	32.00	8.80
	3rd Dosage (after 90 min)	10	90	1.0	5.0	112	40	28140	33.28	9.10
	4th Dosage (after 120 min)	8	80	0.0	4.5	130	50	27700	32.00	8.80
Concrete produced from 53 grade cement with Conplast 430	No Dosage (after 0 min)	-	20	-	2.0	-	80	27300	23.11	8.65
	1st Dosage(after 30 min)	17	80	1.5	4.8	96	55	29000	36.77	8.70
	2nd Dosage (after 60 min).	12	90	1.2	6.0	100	45	27620	39.34	9.00
	3rd Dosage (after 90 min)	12	95	1.2	7.0	114	40	28230	40.78	9.10
	4th Dosage (after 120 min)	10	85	0.0	6.0	130	50	27770	37.77	8.60
Concrete produced from 43 grade cement with Zentrament Super BV	No Dosage (after 0 min)	-	20	-	1.5	-	80	26890	19.89	8.00
	1st Dosage(after 30 min)	13	60	1.0	7.0	90	70	27630	24.56	8.20
	2nd Dosage (after 60 min)	13	90	1.2	8.0	95	60	27450	26.20	9.00
	3rd Dosage (after 90 min)	12	92	0.0	8.5	105	55	27510	30.34	9.60
	4th Dosage (after 120 min)	12	75	0.0	4.5	120	80	27180	26.78	8.40
Concrete produced from 53 grade cement with Zentrament Super BV	No Dosage (after 0 min)	-	20	-	2.0	-	80	27290	23.11	8.65
	1st Dosage(after 30 min)	15	90	1.5	7.0	90	65	27430	30.56	9.00
	2nd Dosage (after 60 min)	15	100	1.2	8.6	95	60	27700	32.00	9.50
	3rd Dosage (after 90 min)	12	110	1.0	8.7	110	55	27700	33.00	9.90
	4th Dosage (after 120 min)	10	100	0.0	6.5	120	75	26870	30.66	9.10

3. Conclusions

The following conclusions can be drawn -

a. The strengths (compressive & flexural) and workability as measured from slump, flow and vee bee degree on concrete produced from 43 grade & 53 grade cements both, using Conplast 430, show an increasing trend upto the application of third repeated dosage, each dose being applied at an interval of 30 minutes. After the third dosage there is no increase in strengths and workability.

b. The strengths (compressive & flexural) and workability as measured from slump, flow, and vee Bee degree on concrete produced from 43 grade & 53 grade cements both, using Zentrament Super BV, show an increasing trend upto the application of third repeated dosage, each dose being applied at an interval of 30 minutes. After the third dosage there is no increase in strengths & workability.

c. Loss of workability of superplasticized concrete can be controlled through the repeated dosage application. But at the same time, it should be remembered that more number of repeated dosage application of superplasticizer will bring down both workability and strengths of concrete. Thus every superplasticizer has a definite number of repeated dosage application, after which it may produce ill effects in concrete. Therefore superplasticizers have to be used cautiously during their repeated applications. Otherwise they may induce undesirable properties to concrete.