EFFECT OF SUPERPLASTICISERS WITH DIFFERENT COMPOSITIONS ON RHEOLOGICAL PROPERTIES

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TYPES OF SUPERPLASTICIZERS

- SUPERPLASTICIZER A
  (Naphthalene Formaldehyde Condensate)
- SUPERPLASTICIZER B
  (Sulphonated Melamine Formaldehyde Condensate)
- SUPERPLASTICIZER C
  (Aqueous De Policarboxilato)
- SUPERPLASTICIZER D
  (Aqueous Solution of Ligno Sulphonate)

Properties of super plasticizer A

Composition	**Naphthalene Formaldehyde Condensate**
Specific gravity	**1.2-1.5**
Chloride content	**Nil**
Additional air content	**1% at normal dosage**
Solid content	**40%-42%**
Compatibility	**all types of cement except high alumina cement**
Operating temperature	**10˚ c to 40˚c**

Properties of super plasticizer B

Composition	Sulphonated Melamine Formaldehyde Condensate
Ph(concentrate)	~10
Boiling point/range (˚c)	>100
Flash point (closed ˚c)	none
Auto flammability(˚c)	not applicable
Explosive property(%)	not applicable
Oxidizing property	not determined
Solid content	38%-40%
Vapor pressure(kPa @ 20˚c)	2.13
Relative density(at 20˚c)	1.10(water)
Water solubility	miscible

Properties of super plasticizer C

Composition	Aqueous De Policarboxilato
Ph(concentrate)	6.5
Boiling point/range (˚c)	>100
Flash point (closed ˚c)	none
Auto flammability(˚c)	not applicable
Explosive property(%)	not applicable
Oxidizing property	not determined
Solid content	42%-45%
Vapor pressure(kPa @ 20˚c)	not determined
Relative density(at 20˚c)	1.075(water)
Water solubility	soluble

Properties of super plasticizer C

Composition	Aqueous Solution Of Ligno Sulphonate
Ph(concentrate)	4.5-5
Boiling point/range (˚c)	>100
Flash point (closed ˚c)	none
Auto flammability(˚c)	not applicable
Explosive property(%)	not applicable
Oxidizing property	not determined
Solid content	36%-38%
Vapor pressure(kPa @ 20˚c)	2.3
Relative density(at 20˚c)	1.19(water)
Water solubility	soluble

TESTS CONDUCTED

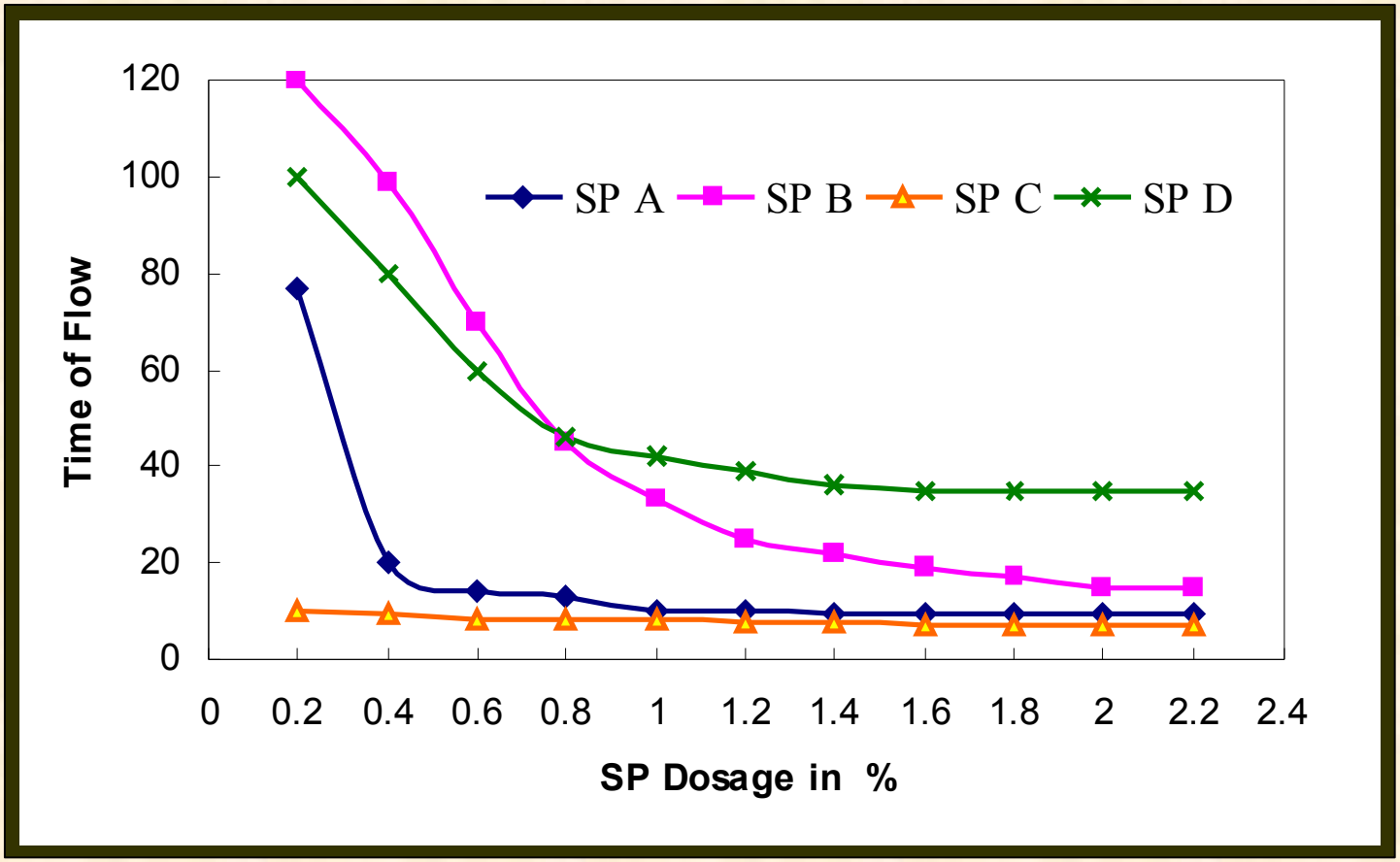
- Marsh cone test
- Mini slump test
- Flow table test

MARSH CONE TEST

Marsh cone efflux time (seconds)

S. NO.	Dosage % by weight of cement	Dosage quantity in ml	SP A	SP B	SP C	SP D
1	0.2	2	77	120	10	100
2	0.4	4	20	99	9.47	80
3	0.6	6	14	70	8.57	60
4	0.8	8	13	45	8.35	46
5	1.0	10	10	33	8	42
6	1.2	12	9.97	25	7.59	39
7	1.4	14	9.49	22	7.53	36
8	1.6	16	9.4	19	7.28	35
9	1.8	18	9.4	17	7.2	35
10	2.0	20	9.4	15	7.2	35
11	2.2	22	9.4	15	7.2	35

MARSH CONE TEST RESULTS

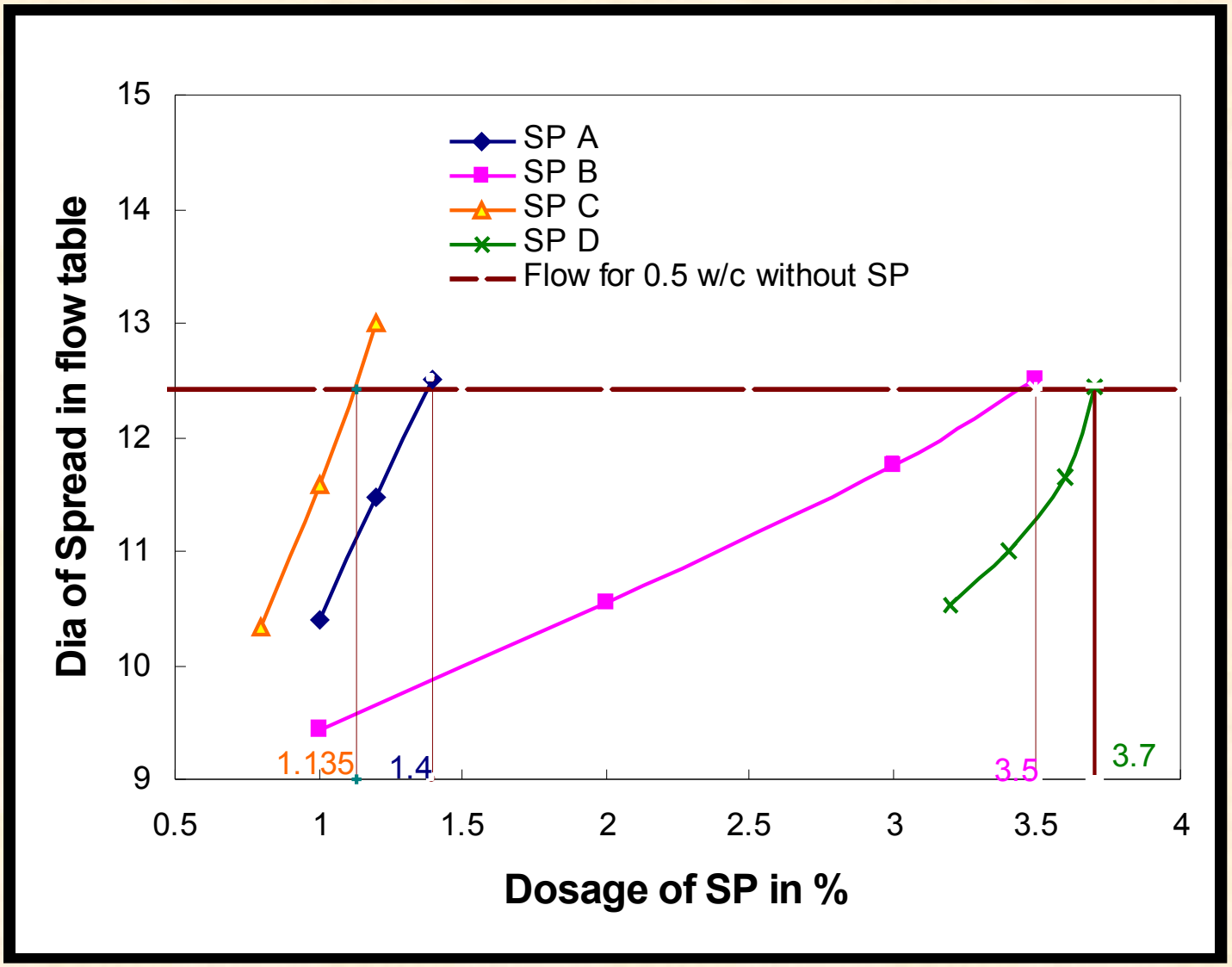


FLOW TABLE TEST

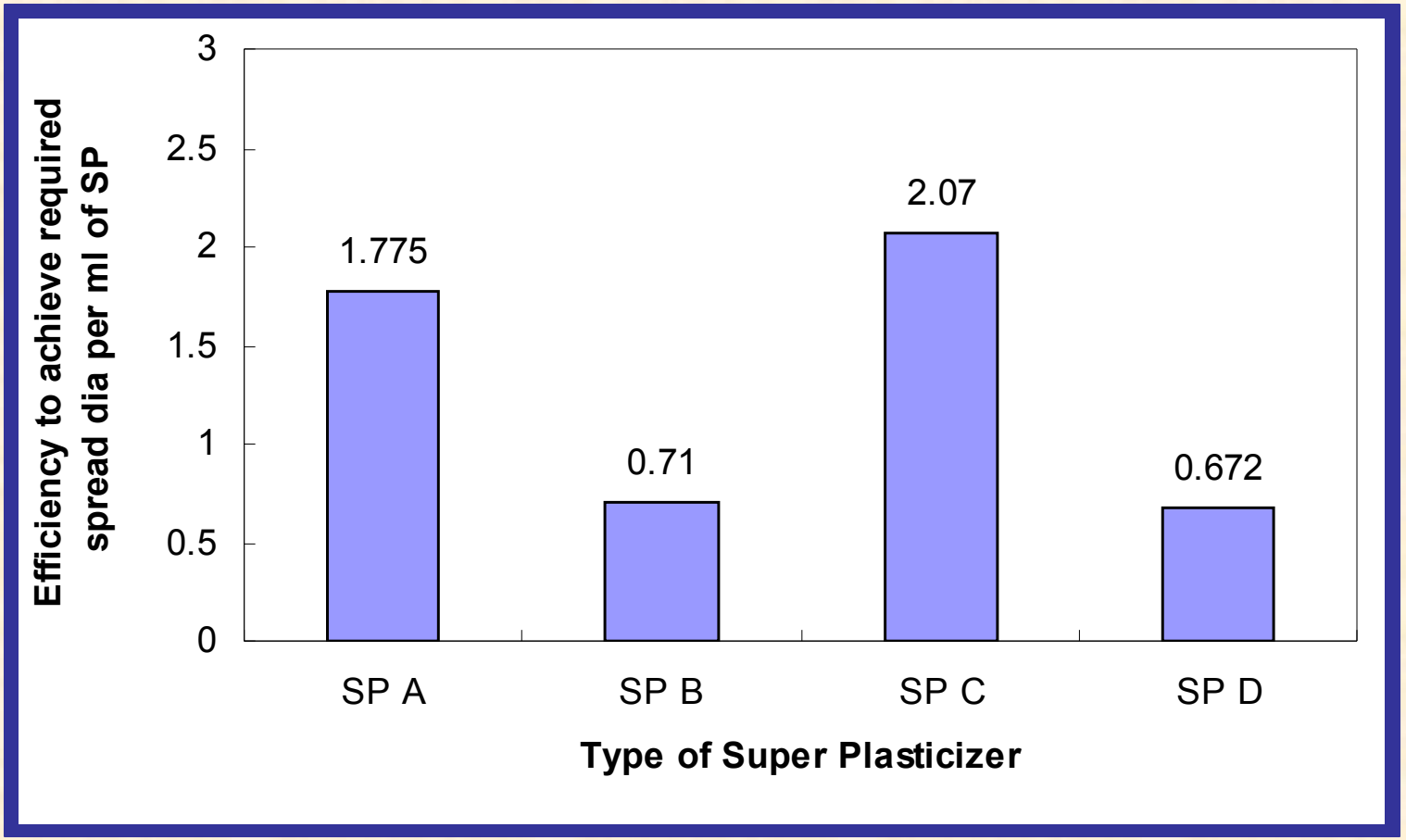
FLOW TABLE RESULTS

w/c ratio	SP Dosage in %	Average spread diameter of mortar in cm			
		A	B	C	D
0.5	0	12.425	12.425	12.425	12.425
0.4	0.8	NF	NF	10.34	NF
0.4	1.0	10.400	9.43	11.57	NF
0.4	1.2	11.475	9.43	13.00	NF
	1.4	12.500	9.43		NF
	2.0		10.55		NF
	3.0		11.75		NF
	3.2		11.75		10.53
	3.4		11.75		11.00
	3.5		12.50		11.00
	3.6				11.65
	3.7				12.45

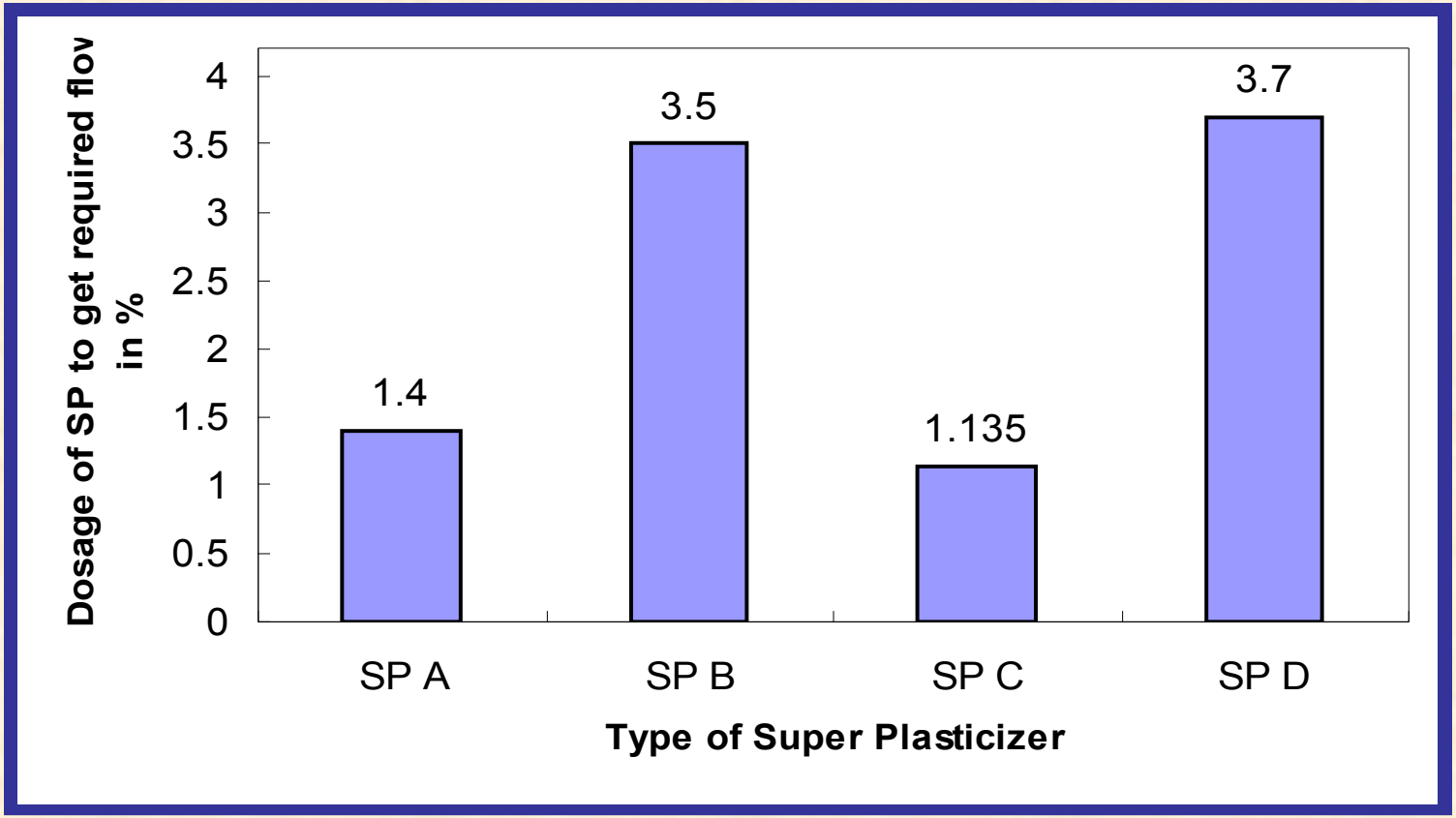
Determination of Efficiency of SP for cement mortar by flow table test



Efficiency to achieve equivalent dia of spread in mm for 1ml of SP



Comparison of efficiency of different types of SP by Flow Table Test

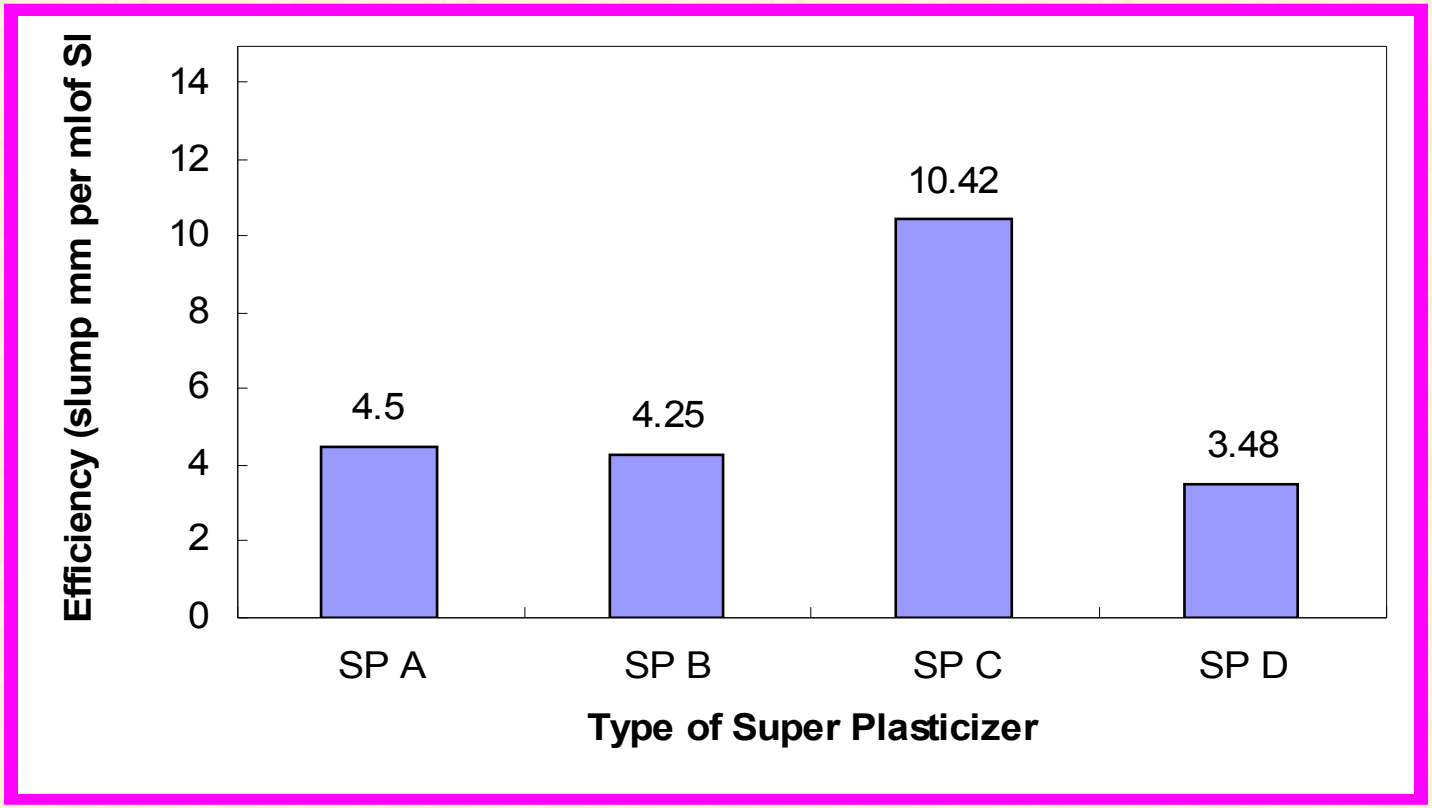


Slump Value of Different types of Super Plasticizer

FLOW RATE IN SLUMP

S. No	Type of SP	Dosage in ml	Slump mm	Time sec	Flow rate mm/sec	Efficiency mm / ml of SP
1	A	24	107	27	3.96	4.50 (II)
2	B	40	170	59	2.88	4.25 (III)
3	C	12	125	30	4.17	10.42 (I)
4	D	40	139	40.6	3.42	3.48 (IV)

Efficiency to achieve slump in mm for 1ml of SP



Compressive Strength Test Results

S. No	Type of SP	Compressive strength after 7 days curing in N/mm^2	Efficiency at7 days Strength in MPa /ml of SP	Compressive strength after 28 days curing in N/mm^2	Efficiency at 28 days Strength in MPa /ml of SP
1	No SP	19.77	-	28.24	-
2	A	23.33	1	34.80	1.450
3	B	21.77	0.54	32.50	0.813
4	C	27.77	2.31	41.45	3.450
5	D	nil	-	20.00	0.500

COST COMPARISON

Identification	Product	Base	Rate (Rs.)
SP A	Conplast SP 430	Sulphonated Naphthalene	90.00 / Litre
SP B	Conplast M1	Melamine	110.00 / Litre
SP C	Structuro 100	Poly Carboxilato	170.00 / Litre
SP D	Conplast P211	Ligno Sulphonate	60.00 / Litre

CONCLUSION

- Type C SP i.e., De PoliCarboxilato based SP is very compatible with cement and the efficiency with respect to workability and strength is high when compared to other types.

- Type A gives better results and its efficiency is higher than that of type B and type D super plasticizers

THANK YOU