

Effect of Super-Plasticizer on Strength & Workability of Concrete

Priya Tiwari¹, Prof. Anubhav Rai²

¹Post Graduate Student, (Civil department Gyan Ganga Institute of Science & Technology, Jabalpur)

²Associate Professor,(Civil department Gyan Ganga Institute of Science & Technology, Jabalpur)

Abstract:

The addition of super plasticizers to concrete confers high strength and workability to it at reduced water/cement ratio. The high workability of super plasticized concrete inevitably permits the use of super plasticizers in ready mix concrete in order to offsets the major challenges of slump loss associated with delays in placing of concrete or accelerated setting due to hot weather condition s. however, the gains of super plasticizer are likely to be reversed if the incompatibility issues between the cement and the super plasticizer are not addressed. With the growing numbers of new cement brands in India proper guidelines on the use of super plasterers with the local cement brands need to be developed in order to prevent the problem of incompatibility and subsequently obtain the maximum benefit of using super plasticizers.

Keywords— Super plasticizer, Compressive Strength, Slump Test, Flexural Strength.

I. INTRODUCTION

Due to the availability of different types of admixtures and cement in the market, there is flexibility in choosing the right composition of the concrete according to the desired parameters, keeping in mind the overall economy and environmental safety. Admixtures, especially new super-plasticizers are being developed regularly in the world, which dramatically change the properties of the concrete. But if there is incompatibility between the cement and the admixtures, it may cause rapid slump loss due to quicker setting of concrete or unacceptable low early strength (slump retention) due to excessive retardation of setting time, in addition to economic loss.

A series of tests thus carried out, analyzed and compared to concrete manufactured with different dosage (0.5%, 1%, and 1.5% by the weight of cementitious material)of super plasticizer.

II. RESEARCH SIGNIFICANCE

Previous studies show that the use of super-plasticizer in concrete no adverse affect was found in Workability, strength and durability of concrete. In past researches investigation focused mainly on the relationship between super-plasticizer and cement.

III. OBJECTIVES

To study the variation of workability, compressive strength and flexural strength with the addition of super-plasticizer on concrete cube.

IV. Material & Methodology

Cement: Ordinary Portland Cement (OPC) conforming to IS 8112-1989 was used for this study; The OPC UltraTech of 43 Grade has been used.

Fine Aggregate: River Sand Conforming to Zone-II of IS 383-1970 has been used.

Coarse Aggregate: Two fractions of nominal size as 20mm & 10mm were used in this study.

The following laboratory tests were performed on aggregates as per relevant IS code & mix Design of M40 grade of concrete containing super plasticizer as an admixtures will be carried out. The laboratory test programmed was proposed as under.

(A) Physical properties of coarse aggregate (20mm and 10mm)

- Sieve analysis and fineness modulus.
- Specific gravity.
- Water absorption.

(B) Physical properties of fine aggregate

- Sieve analysis and fineness modulus.
- Specific gravity.
- Water absorption.
- Silt Content.

(C) Mix design proportion of M-40 grade as per IS 10262:2009 containing OPC and Super Plasticizer.

(D) Addition of super plasticizer @0.5%, 1%, 1.5% by the weight of cementitious materials in concrete.

(E) Study of Workability of fresh concrete.

(F) Study of Compressive Strength @7, 14 & 28 days.

(G) Study of Flexural Strength @7, 14 & 28days.

Table 1: Properties of Super plasticizer SHELL PLAST SP 500 (PQC)

Product Properties	Specifications
Appearance	Dark Brown Liquid
Specific Gravity	1.230
pH	7.20
Solid Content	42

Table 2: Properties of material used

S.NO.	PARAMETERS	TEST VALUE
1	Sp. Gravity of CA	2.88
2	Sp. Gravity of FA	2.591
3	Water Absorption of CA	1.1 %
4	Water Absorption of FA	0.67 %
5	Silt Content	3.03

V. Experimental Procedure

In this study M40 Grade of concrete was designed as per IS code. In this study super-plasticizer was added in different proportions 0%, 0.5%, 1% & 1.5%.

For each dose 3 sets of cube and 2 sets of beam were casted, in each set 3 cube were casted and 4 beams were casted. And later on the compressive strength at 7, 14 & 28 days and flexural strength at 7 days and 28 days was checked.

VI. RESULTS

The test results obtained are summarized in Table 3, Table 4 & Table 5 shown below and the variation is shown in the figure-1, figure-2 & figure-3

Table 3: Workability

Super-plasticizer	W/C Ratio	Slump
0 %	0.39	40
0.5 %	0.39	50
1 %	0.39	90
1.5 %	0.39	140

Table 4: Compressive Strength

Dosage of SP	No. of Curing Days	7days	14days	28days
0 %	Compressive strength	36.44	42.22	51.11
0.5 %		39.42	46.4	49.7
1 %		42.07	49.88	55.85
1.5 %		37.67	42.32	50.25

Table 5: Flexural Strength

Dosage of SP	No. of Curing Days	7days	28days
0 %	Flexural Strength	5.67	7.18
0.5 %		4.67	6.51
1 %		4.92	6.65
1.5 %		4.40	5.62

Figure-1 Comparisons of Workability

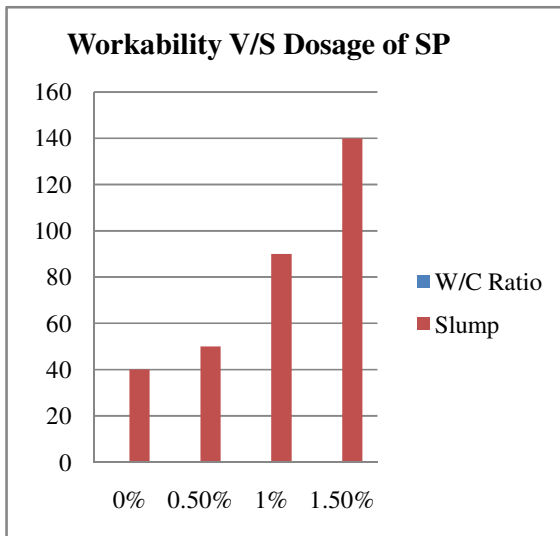


Figure-2 Comparisons of Compressive Strength

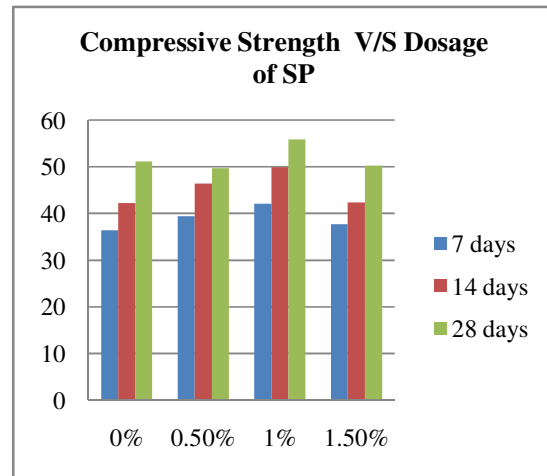
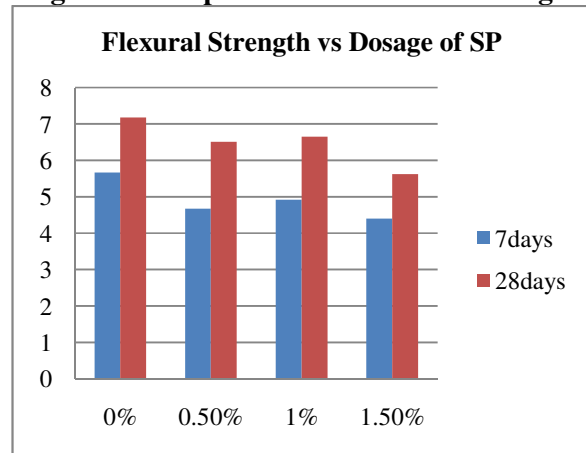


Figure-3 Comparisons of Flexural Strength



VII. CONCLUSIONS

On the basis of the results obtained in this study, the following conclusions have been drawn:

- Adding Shell plast SP 500 results in increasing the workability as well as strength of concrete.
- The optimum quantity of shell plast SP 500 is found as 1%.
- At this percentage of Super-plasticizer compressive strength was increased by 9.27% and flexural strength was decreased by 7.38%.

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