International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 6 Issue 6, September-October 2022 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Mechanical Properties and Effect of Super Plasticizer (Conplast Conplast SP 430) on Fresh Properties of Self-Compacting Concrete: An Experimental Study

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ABSTRACT

Due to its high compressive strength, ability to operate as a bonding agent, and other characteristics, concrete is the second most often used substance in the world after water. It is most frequently utilized in the construction industry. Today, super plasticizers are employed in all significant projects across the world, including tall structures, prestressed concrete, slender components with crowded and densely packed reinforcing, beams and slabs, and long, slender columns.

KEYWORDS: *compressive strength, frequently, construction, utilized, structures, Reinforcing*

How to cite this paper: Chandrashekhar Khulhare | Dr. P. K. Singhai | Abhay Kumar Jha | Barun Kumar "Mechanical Properties and Effect of Super Plasticizer (Conplast Conplast SP 430) on Fresh Properties of Self-Compacting Concrete: An Experimental Study" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-6, October 2022, pp.1818-1821, URL: www.ijtsrd.com/papers/ijtsrd52163.pdf

IJTSRD52163

I. INTRODUCTION

Numerous ways to examine various bond qualities, but there are very few ways to measure shear. To assess the monolithic nature of reinforced concrete composite parts, it is crucial to examine the bond strength between concrete layers that are cast at different times. Chemical admixtures are now commonly used in construction because of the requirement for efficient and quick building. Super plasticizer is one of these admixtures that has a particularly large market today because it may improve the workability of freshly prepared concrete, which is one of its main problems (Shah et. al, 2014).Being able to effectively disperse cement particles and increase the workability of concrete are two benefits of having super plasticizers in a concrete mixture. According to Collepardi et al. (1999), super plasticizers can be added to concrete mixtures to achieve any one of the following three goals:

II. OBJECTIVES OF THE PRESENT STUDY

- To design a mix of M30 and M40 grade of concrete specimen.
- To investigate the compressive Strength, concrete for M30 and M40 grade.
- Evaluation of the Flexural strength of concrete for M30 and M40 grade.
- How to improve workability.
- How strength are increasing in present research work.
- To minimize cement content for cost savin

III. LITERATURE SURVEY

Alsadey (2012) presented the effect of superplasticizer (SP) on properties of fresh and hardened concrete has studied; the properties of concrete inspected are compressive strength and slump test, hence, an experimental investigation

conducted to determinethe optimum dosage for the admixture and to study the effect of over dosage of the mentioned admixture, together with one control mixed. The difference between concretemixes comes from dosages of admixture, which used at amounts 600, 800, 1000, and 1200 ml/100 kg of cement were prepared. However, compressive strength is improved by dosage 1.0 % of SP after 28 days curing is 55 N/ mm^2 , which is higher than that of control concrete, the optimum amount of admixture must be 1 %. Over dosage of SP found to deteriorate the properties of concrete with indication of lower compressive strength. The workability of concrete can be increased by addition of superplasticizer and the slump loss can be reduced by using the chemical admixtures.

Hameed (2012) discussed the results of an experimental investigation into the propertiesof self-compacting concrete (SCC) mixes having varying dosage of high-performance superplasticizer (Glenium 51) (0.5%-3.0%) L per 100 kg of cement material. Theproperties investigated are workability on the fresh state of concrete by using one mix with five superplasticizer dosage (0.5%,1.0%,1.5%,2.5% and 3.0%) is used. The workability was assessed using three tests according to the specification of self-compacted concrete (slump flow, L- box differential height and V-funnel tests. The three dosage (1.0%, 1.5% and 2.5%) comply with requirement for production of SCC while 0.5% and 3.0% don't comply with specification requirement. Dosage of superplasticizer need to produce self-compacted concrete range between (1.0%-2.5%) L/100 kg of cement according to the condition and material used in this paper.

Dubey and kumar (2012) Investigated experimental study of six trial mixes were prepared by varying the dosage of SP from 2% to 12% of cementious material with an increment of 2% for each test series (Polycarboxylate ether based superplasticizer complying with ASTM C 494 type F, with density 1.08 kg/l and pH 4.8 was used in the present investigation as SP). In order to investigate self-compacting characteristics in fresh state of mix proportion with varying dosages of SP slump flow test (slump flow diameter and T50cm time), and L-Box test (blocking ratio) were performed.

Tamrakar and Mishra (2013) studied the effects of three superplasticizers (Rheobuild 1125, Glenium 140, Pozzolith 225) on fresh and hardened concrete. The experiment program included test on workability, slump loss and compressive strength. In this experimental works we are comparing the properties of superplasticizer based concrete with that of without superplasticizer added concrete. From the results of the study the workability of concrete can be increased by addition of superplasticizer. However, very high dosages of SP tend to impair the cohesiveness of concrete. Slump loss can be reduced by using the chemical admixtures. However, effectiveness is higher for superplasticizer concrete. Superplasticizer permitted a significant water reduction while maintain the same.

IV. Testing of Materials

Preparation of Mix Design

Mix Design for M 40 with Water Cement Ratio 0.35 and using super plasticizer and 20mm size nominal aggregate

Characteristics strength =f_{ck} + 1.65 sWhere s = 5 N / mm^2

So characteristics strength = 48.25 N / mm^2

According to IS: 10262 when using 20 mm aggregates take water = 186 KgUsing super plasticizer reduction of water = 25% (according to IS: 10262) So water = 75% of 186 kg =139.5 kg

As water cement ratio taken = 0.35

So cement (PPC) = water / 0.35 = 139.5 / 0.35 = 398.57 kg/m^3 (320 to 450 acc. to IS: 456)Sand used is of zone 2

Now for 1m^3

Cement = 398.57 / (specific gravity x 1000) = 0.126 kgWater = 139.5 / 1000 = 0.139 kg

Super plasticizer Volume = 0.006 m^3

Now Total Aggregate Volume = 1- 0.126 – 01.39 – 0.006 = 0.729 kg

Volume of Aggregate in coarse = 0.729 x. 56 x 1000 x 2.69 = 1081.836 kg

Volume of Aggregate in fine = 0.729 x. 44 x 1000 x 2.65 = 850 kgNow ratio of cement: fine: coarse = 1: 2.1: 2.7

Table 1 Fine Aggregate Sieve Analysis

Sieve size (mm)	Percentage retain	Percentage passing	BS 882 1992
10	0	100	100
5	2.33	97.7	90 – 100
2.36	5.5	94.5	75 – 100
1.18	19.47	80.5	55 – 90
0.6	46	54	35 – 59
0.3	79.5	20.5	8 – 30
0.15	96	4	0 - 10
Total weight	100	0	0

Table 2 Coarse Aggregate single size (10mm) Sieve Analyses

Sieve size(mm)	Percentage retain	Percentage passing	BS 882 1992
50	0	100	100
37.5	0	100	100
20	0	100	100
14	0	100	100
10	3.9	96.1	85 – 100
5	79.4	20.6	0 – 25
2.36	100	0	0 – 5

Table 3: Results of compressive cube strength grade M30 Reference mix (without admixture)
Slump = 55mm w/c = 0.45 (Cube dimension 150X150X150mm)

Ratio C:CA:FA	Age (days)	Load (KN)	Strength (N/mm^2)	Mean strength (N/mm^2)
1: 2.1: 2.7	7	610	27.1	**26.52**
1: 2.1: 2.7	7	600	26.67	
1: 2.1: 2.7	7	580	25.79	
1: 2.1: 2.7	14	700	31.1	**31.33**
1: 2.1: 2.7	14	700	31.1	
1: 2.1: 2.7	14	715	31.78	
1: 2.1: 2.7	28	810	35.99	**34.89**
1: 2.1: 2.7	28	765	33.99	
1: 2.1: 2.7	28	780	34.67	

V. CONCLUSIONS

- Super plasticizers admixtures reduce cement content up to 23%for the two grades without reducing the compressive strength and no effect on workability.
- Super plasticizers admixtures provide improved durability by increasing ultimate strength and reducing w/c ratio.

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