



OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

EFFECT OF DIFFERENT PERCENTAGE OF PLASTICIZERS ON PROPERTIES OF CONCRETE

Shahnawaz Ansari¹, Ronak Parikh²

Assistant professor, Department of Civil Engineering, Amity University Rajasthan, Jaipur, India¹

Assistant professor, Department of Civil Engineering, Amity University Rajasthan, Jaipur, India²

sansari@jpr.amity.edu¹, rparikh@jpr.amity.edu²

Abstract: To improve the workability, strength, ability to control during work times and durability of cement concrete, ‘engineers, chemists, manufacturers and others have helped the concrete by adding some additional substances known as admixtures. There are different kinds of admixtures are available; and each admixture has its own specialty. This paper has been made an attempt to study the effect of plasticizer doses of 0.25, 0.30 and 0.35 percentage (by weight of cement) on performance of M15 concrete grade. The tests considered for study are slump test and compressive strength test. The results show that for the constant water cement ratio, increase of plasticizer dose in Concrete leads to gain of good workability. Moreover, there is also slightly increase in compressive strength than that of normal concrete mix.

Keywords: compressive strength test, plasticizer, workability, conventional concrete.

I INTRODUCTION

For developing infrastructures like commercial, industrial, residential, military structures etc., the concrete performance plays an important role. In order to improve its workability, strength, ability to control during work times and durability of cement concrete, ‘engineers, chemists, manufacturers and others have helped the concrete by adding some additional substances known as admixtures [9]. Now a day’s admixture became an essential component for concrete mix, because it provides an understanding for the variance between water and workability and performance of hardened concrete. There are different kinds of admixtures are available; and each admixture has its own specialty. Some admixtures reduce the water content that means to increase the strength of concrete, some admixtures accelerates or retards the setting time of concrete, some admixtures increase the workability of concrete, some admixtures reduces the corrosion effect on reinforced concrete, some admixtures reduce the shrinkage of concrete and some reduces the alkali-silica reactivity. This research paper explains the effect of water reducing admixture on properties of concrete. Water reducing admixtures generally are of two types.

- (1) Plasticizers – which reduces the water requirement by 15% and these are based on Calcium ligno Sulphate,
- (2) Super-plasticizers – reduces the water requirement by 30% and these are based on sulphonated melamine formaldehyde condensate (SMF) and sulphonated naphthalene formaldehyde condensate (SNF) [8].

The general objective of this paper is to evaluate the performance of concrete without and with varying dosages of plasticizer. The main objective is the influence of plasticizer on properties of concrete like workability and strength of concrete through slump and compressive strength tests.

II MATERIALS USED AND PROPERTIES

A. Cement

Cement is one of the most essential components of concrete because of its binding property. Various tests were conducted to determine the properties of Portland pozzolana cement (PPC) of 53 grade confirming to IS: 1489 part – 1, such as fineness = 1.38%, standard consistency = 35%, specific gravity = 3.15, compressive strength at 7 days = 28.09 N/mm² and at 28 days = 64.66 N/mm²

B. Fine and Coarse Aggregates

The aggregates are important because of its strength. To determine the properties of aggregates following tests were conducted. Sieve analysis and specific gravity for fine

and coarse aggregate, aggregate crushing strength and aggregate impact test for coarse aggregate. The tests results are obtained in laboratory for Specific gravity of FA = 2.65 and of CA = 2.76, aggregate crushing strength test = 33.6% and aggregate impact test = 17.28%.

C. Plasticizer

It is a water-reducing admixture based on calcium ligno sulphate. It increases the workability of concrete and ultimately increases the strength of concrete. Three design mixes of M15 with same water cement ratio and varying doses of plasticizer of 0.25, 0.30 and 0.35% of cement content. The plasticizer is locally available.

III CONCRETE MIX PROPORTION

For the performance analysis, three design mix of M15 concrete grade with same water cement ratio 0.58 and with varying dosages of plasticizer of 0.25, 0.30 and 0.35% of cement content are prepared. Three mixes are casted in standard concrete cubes and tested in laboratory and these are named as B, C and D. The concrete with varying dosages of admixture are compared with the normal concrete abbreviated as A.

TABLE 1 MIX PROPORTIONS FOR TRIAL MIXES OF M15 CONCRETE GRADE

Mix	Proportion				
	water	cement	fine aggregate	coarse aggregate	Plasticizer (by weight of cement)
A	0.58	1.01	2.33	4.23	--
B	0.58	1.01	2.33	4.23	0.0025
C	0.58	1.01	2.33	4.23	0.003
D	0.58	1.01	2.33	4.23	0.0035

IV EXPERIMENTAL RESULTS AND DISCUSSIONS

The tests conducted on fresh concrete is slump, on hardened concrete is compressive strength test, and compressive strength test is tested at 7 and 28 days. The water used while mixing is of potable water or drinking water. After casting, the mix in cube mold for 24 hours then the same is cured in normal water of curing tank having room temperature.

A. Workability Test

The workability of fresh concrete is determined by various tests, but here workability is measured through slump test only. From table 2, it is noted that slump value of normal concrete is 60mm. By adding the admixture to the concrete, the friction between the particles decreases and fluidity increases. If water reducing admixture or plasticizer content is increased, then its fluidity or workability also increases.

TABLE 2 WORKABILITY TEST RESULTS FOR VARIOUS CONCRETE MIXES

Concrete mix	Percentage of plasticizer	Workability test (slump in mm)
A	--	60
B	0.25	100
C	0.3	140
D	0.35	170

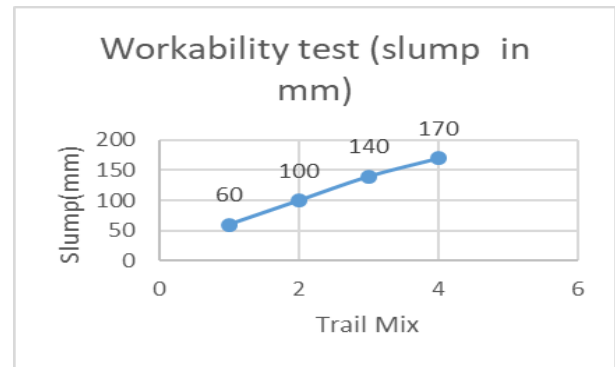


Figure 1 Comparison of Slump Values of Various Mixes at 7 and 28 Days

B. Compressive Strength Test

For each concrete mix, three cubes are casted to know the average compressive strength of concrete cubes at 7 and 28 days of curing in the laboratory. From the table below, the compressive strength of B Trail mix increases at 7 and 28 days when compared to the normal concrete of trail mix A. The compressive strength of trail mixes C and D decreases at 7 and 28 days due to the excess content of plasticizer.

TABLE 3 COMPRESSIVE STRENGTH OF VARIOUS CONCRETE MIXES AT 7 AND 28 DAYS

Mix	% of Plasticizer	Actual Compressive strength(MPa)		Avg. Compressive strength (MPa)	
		7 Days	28 Days	7 Days	28 Days
A	--	10.667	20.222	10.593	21.036
		10.444	22		
		10.667	20.889		
B	0.25	13.555	21.555	12.74	22.222
		11.555	23.111		
		13.111	22		
C	0.3	11.111	18.889	11.037	18.147
		10.889	17.333		
		11.111	18.222		
D	0.35	9.333	17.333	9.852	16.666
		10	16.222		
		10.222	16.444		

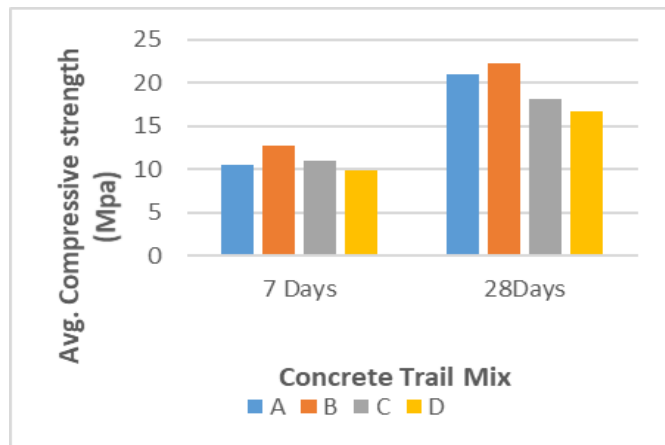


Figure 2 Compressive strength of various trial mixes at 7 and 28 days

V CONCLUSION

The general objective of this paper is to evaluate the workability and compressive strength of concrete mixes of different dosages of plasticizer at 7 and 28 days are:

1. The workability of the concrete increases with the increase in dosages of water reducing admixture or plasticizer
2. The maximum compressive strength occurs in the concrete mix of 0.3% of plasticizer (by weight of cement)
3. By adding the plasticizer, the water content nearly reduces to 15% and it increases the compressive strength of the concrete for 0.3% of plasticizer (by weight of cement)

REFERENCES

[1]Rahul Singh, S.M. Gupta and Babita Saini, Effect of mineral and chemical admixtures on the properties of mortar and concrete – A review, The Indian Concrete Journal, March 2016.

[2]S.M.Dumne, Effect of Superplasticizer on Fresh and Hardened Properties of Self-Compacting Concrete Containing Fly Ash, American Journal of Engineering Research (AJER), 3, No.3, 2014, 205-211.

[3]IS 8112, Ordinary Portland Cement 43 grade, 1989, May 2006.

[4]IS 383, Indian standard specification for coarse and fine aggregates from natural sources for concrete (second revision), Bureau of Indian Standards, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002, 1970.

[5]IS 10262, (Reaffirmed 1999), Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002, 1982.

[6]SP 23, Handbook of concrete mixes (based on Indian standards), Bureau of Indian Standards, Manak Bhavan 9 Bahadur Shah Zafar Marg, New Delhi 110 002, 1982.

[7]Saeed Ahmed, Attaullah Shah, Karamet Ali, Effect of Water Reducing Concrete Admixtures on The Properties of Concrete, Our World in Concrete and Structures, 2004.

[8]M K Maroliya, Influence of chemical admixtures on density and slump loss of concrete, International Journal of Modern Engineering Research (IJMER), 2(6), 2012,4077-4079.

[9]Anitha J, Pradeepa S, Lalit Soni, Rakshit K B, Influence of Admixtures on Behavior of Concrete, International Journal of Research in Advent Technology, 4, No.11, 2016.