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EFFECT OF SIKA VISCOCRETE ON PROPERTIES OF CONCRETE

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ABSTRACT

We have understood that as we decrease water content strength of concrete increases but this is at the expense of workability. Workability of concrete can be defined as the ease with which it can be used on field. Generally, on field high workable concrete is required. So, for meeting both the criterias super plasticizers are used. The super plasticizers (SP) are referred to as high range water reducing admixture, mainly disperses the water in concrete matrix. There are many types of SP's present but a SP has to be selected keeping in view the conditions of the field and the requirement.Here, we are going to test the effect of Sika Viscocrete on various properties of concrete ie.Workability, water/cement ratio and compressive strength. These properties will be tested in concrete of grade M50 (1:1.5:3) and at various dosages of SP dosages (0.4%, 0.5% & 0.6%).

KEYWORDS: Sika Viscocrete, Concrete, Compressive Strength, Cement, Coarse Aggregate, Workability

INTRODUCTION

In present world, almost all the structures have been found to have concrete as an important building material which is a mixture of sand, cement, coarse aggregate and water. In order to construct bridges, dams, retaining walls, high rise building and chimneys, concrete has been an important building material. But these structures are in continuous need of high strength which can only be achieved either by increasing cement content or decreasing w/c ratio but the first method increases the cost of project. Hence, to increase the strength of concrete we have to decrease water cement ratio without affecting workability. SP's have proved their efficiency in this direction. In present study, effectiveness of Sika Viscocrete (Super plasticizer) in improving the strength of concrete and workability at different dosages (0.4%, 0.5% & 0.6%) is studied. SP do not participate in any chemical reactions with cement or bending material used in concrete. Their actions are only physical in fluidizing the mix, made even with low water ratio. Their fluidifying action lasts only as long as the mix is in plastic condition. Once the effect of adsorbed layer is lost, the hydration process continues normally.In low quantities super plasticizer have no bad impact on the properties of hardened concrete. (up to 3%), Only in case of bad quality lignosulphonate based plastcizer ,it may result in air entrainment, which reduces the strength of concrete.When super plasticizers are used , they get adsorbed on the cement particle and adsorption of these charged polymer on the particles of cement creates particle to particle repulsive forces which overcome the attractive forces. This repulsive force is called **zeta potential.** Due to this the particles get deflocculated and dispersed and the water trapped is released and now available to fludify the mix.

METHOD AND MATERIALS

Cement

Cement is prepared by heating limestone with certain small quantity of materials like clay to a temperature of about 1500°C. This process is called as calcination where one molecule of CO_2 or quicklime is blended with other materials that have been included as a part of the mix.

In order to make ordinary Portland cement, the above mix called as Clinker is blended with a small amount of gypsum to delay the setting time to a much greater extent. In large number of grout or filler operations, this ordinary Portland cement is used. This OPC has also been an important ingredient in concrete and mortar.

This cement helps in providing appropriate strength to concrete mix as well which is a blended mixture of small aggregate, coarse aggregate and water. Concrete contains composite material which consists of gravel and sand. Following table indicates important components and their respective percentage compositions:

Table1: Components of Cement

Component	Composition
Fe_2O_3	0.6-0.7%
SO_3	1.2-3.2%
CaO	60-65%
MgO	0.2-4.5%
Na_2+K_2O	0.3-1.5%
IR	0.5-1.5%
SiO_2	15-30%
Al_2O_3	5-10%

Sika ViscoCrete

Sika ViscoCrete Premier *is a super plasticising and accelerating concrete admixture based on Polycarboxylate polymers. Sika ViscoCrete Premier is compatible with all Portland cements including SRC.*As a superplasticizer, it substantially improves workability without increasing water or the risk of segregation. As a water reducer it decreses up to 40% water &. 40% increase in 28 day strength is also possible.

Table 2: Properties of Sika ViscoCrete

Property	Description
Form	Liquid
Colour	Yellow
Relative Density	1.080
pH Value	4.3
Chloride Content %	<0.1 Chloride Free
Alkali Content %	0.6

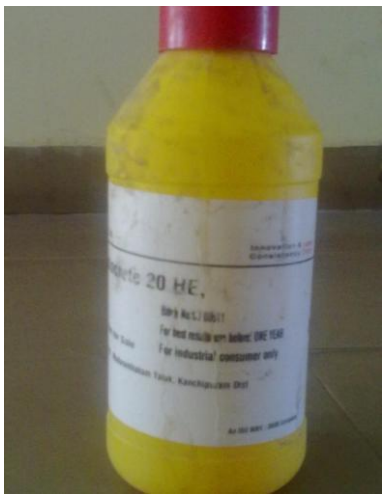


Figure 1: Sika Viscocrete

Effect of Sika ViscoCrete on Workability at Constant w/c Ratio (Mix Ratio 1:1.5:3)

Components of Concrete

Table 3: Trial 1(0% SP AND W/C RATIO 0.45)

Content	Quantity
Cement	400 kg/m^3
SP Dosage	0% of cement
Fine aggregate	614.9kg/m^3
Coarse Aggregate	1216.6kg/m^3
w/c	0.45

Table 3: Trial 2(0.4% SP AND W/C RATIO 0.45)

Content	Quantity
Cement	400 kg/m^3
SP Dosage	0.4% of cement
Fine aggregate	613.31kg/m^3
Coarse Aggregate	1212.96kg/m^3
w/c	0.45

Table 4: Specific Gravities of Components

Material	Specific Gravity
Cement	3.15
Fine Aggregate	2.61
Coarse aggregate	2.66
Sika ViscoCrete	1.08

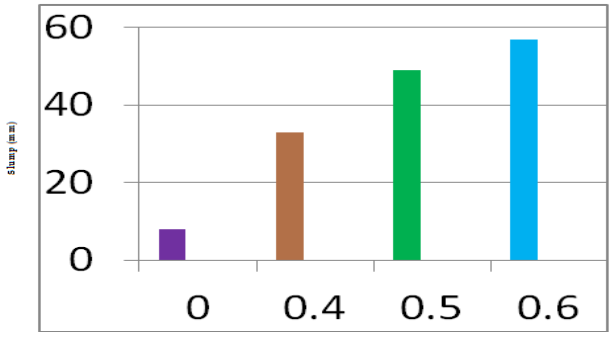
RESULTS AND DISCUSSIONS

The results and discussions in these tables include workability at different Sika ViscoCrete dosages ie 0.4%, 0.5% & 0.6% at constant w/c ratio.

Table 5: Workability at different SP Dosages

Trial Number	Sp Dosage	W/C Ratio	Slump (Mm)
1	nil	0.45	8
2	0.4%	0.45	33
3	0.5%	0.45	49
4	0.6%	0.45	57

Bar Graph: These results are depicted on a bad graph with dosage of super plasticizer on x- axis and slump value on y- axis.



Super Plasticizer Dosage

Graph 1: Effect of Sika Viscocrete on Workability

Effect of Sika Viscocrete on w/c Ratio and Compressive Strength at Constant Workability (Mix Ratio 1:1.5:3)

Slump value we got during 0% SP and 0.4 w/c ratio is 11mm. Now different trials are executed till we get the same slum value.

Components of Concrete

Table 6: Trial 1(0.4% SP AND W/C RATIO 0.42)

Content	Quantity
Cement	400 kg/m^3
SP Dosage	0.4% of cement
Fine aggregate	623.79kg/m^3
Coarse Aggregate	1223.6kg/m^3
w/c	0.42
Slump Value	**18mm**

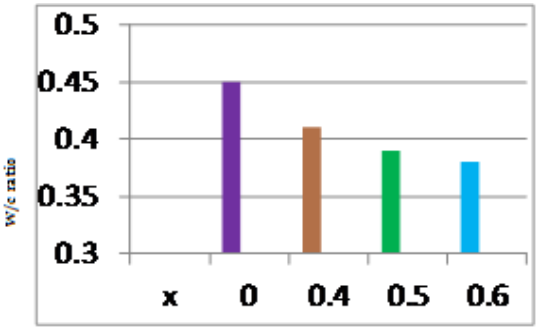
Table 7: Trial 2(0.4% SP AND W/C RATIO 0.41)

Content	Quantity
Cement	400 kg/m^3
SP Dosage	0.4% of cement
Fine aggregate	626.4kg/m^3
Coarse Aggregate	1242.22kg/m^3
w/c	0.41
Slump Value	**12mm**

The slump value in trial 2 is approximately equal to original. Similar trials are performed for 0.5% & 0.6% dosages of Sika Viscocrete.

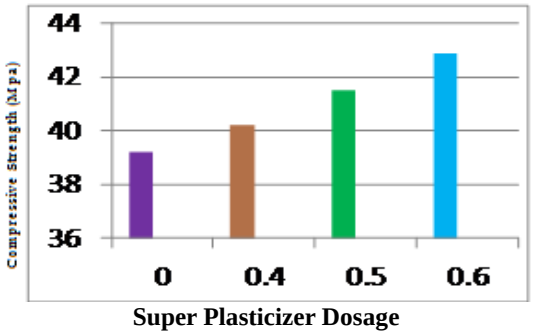
RESULTS AND DISCUSSIONS

The results and discussions in these tables include w/c ratio and compressive strength (7 days, 14 days & 28 days) at different Sika ViscoCrete dosages ie 0.4%, 0.5% & 0.6% at constant workability.



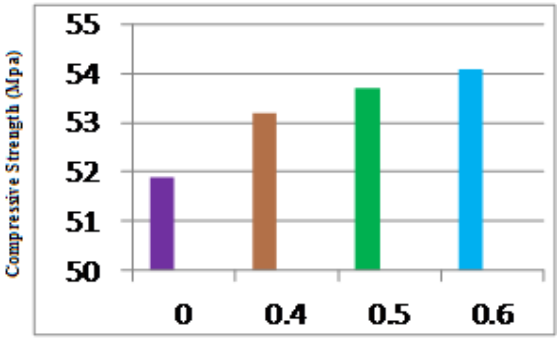
Super Plasticizer Dosage

Graph 2: Effect of Sika Viscocrete on w/c Ratio

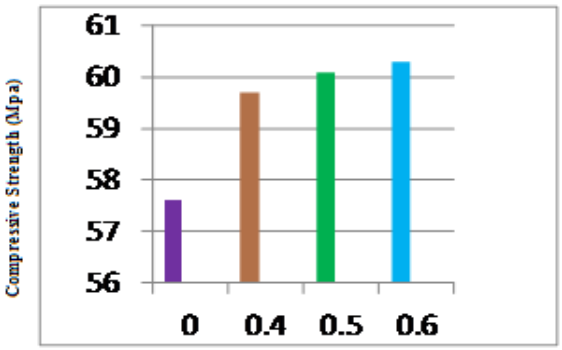


Super Plasticizer Dosage

Graph 3: Effect of Sika Viscocrete on Compressive Strength (7 Days)



Graph 4: Effect of Sika Viscocrete on Compressive Strength (14 Days)



Graph 5: Effect of Sika Viscocrete on Compressive Strength (28 Days)

CONCLUSIONS

In the study, during finding the relation between SP dosage and workability w/c ratio is kept constant.From the graph it is visible that workability increases with the increase in the dosage of superplasticizer. However there is no appreciable increase in slump beyond certain limit of dosage.Improvement in slump value also depends on initial slump of the mix, type, dosage, and time of addition of superplasticizer; w/c; and the nature or amount of cement.. Therefore to get more accurate result the cement content and w/c ratio was kept constant as 400 kg/ m3 and 0.45 respectively. For completion of second objective, workability is kept constant (11 mm) and relation between w/c ratio and compressive strength (7 days, 14 days & 28 days) with SP dosage is estimated. From the graphs 2-5, it can be seen that w/c ratio reduces and compressive strength is increasing with SP dosages. All in all, from the experiment is clear that superplasticizer can produce,

- At the same w/c ratio much more workable concrete than the plain ones.
- For the same workability, it permits the use of lower w/c ratio.
- As a consequence compressive strength also increases.

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