Cembinder Concrete using Robo Sand

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Abstract

Cembinder is an amorphous colloidal silica product containing nano silica particles which when used in concrete induces a pozzolonicreaction between nano sio_2 and the calcium hydroxide to form more CSH gel which is the main component responsible for the strength of concrete. The aim of the project is to study the effect of cembinder on the compressive strength of concrete usingcembinder as an admixture in varying proportion of 0%, 1%, 5%, 8%, 10% by weight of cement. M20 grade concrete is designed for this project as per BIS 10262-2009. The materials are proportioned, mixed and casted and are set to curing in the atmospheric temperature of about 30^o c to 40^oc for 7 days,14 days and 28 days, and are then tested for compressive strength. The compressive strength of the conventional M20 grade concrete was 28.36 N/$mm^2$and the highest strength achieved using cembinderincreased considerably to about 37.61 N/mm^2.The usage of cembinder as an admixture in concrete only enhances the overall performance of concrete, but if it is used in excessive percentage it has adverse effects.

Keywords - *Concrete, Cembinder, Colloidal silica, Compressive strength, Environment, Robo sand.*

I. INTRODUCTION

Cembinder contains colloidal silica particals and when used as aadmixture in concrete, silica reacts with calcium hydroxide to form more csh-gel,this is known as pozolonic reaction and the nano particles of sio_2 can fill the spaces between the particals of csh gel,therefore it also acts as a nano fillir , incresing the density and reducing the porosity of concrete. Cembinder 17 has been used in this project

Manufactured by akzonoble .m20 grade concrete mix is desinged as per bis 10262-2009. Cembinder was used an admixture in varrying proportion of 0%, 1%, 5%, 8%, 10%
. W/c ratio and super plasticizer were kept constant at 0.6.

The concrete was casted in the moulds of dimension 150cmx150cm x150cm(lxbxh), then they were cured for 7 days,14 days and 28 days, compresive strength test were conducted respectively on universal testing machine.

II. EXPERIMENTAL WORK

- Materials Used
- Procedure
- Proportions
- Tests

A. Materials Used

1) Cement:

The cement used is Portland cement of 43 grade confirming to IS 8112-1989 is used in this study. The specific gravity, initial and final setting time of cement is respectively found as 3.01, 165 minutes and 255 minutes. Compressive strength of cement was 46 N/mm.

2) Coarse Aggregates:

Coarse aggregate used has a maximum size of about 40 mm. The coarse aggregate having a specific gravity 2.68. Aggregate Crushing value is 17% and Aggregate Impact Value is 14% & abrasion value is 17%.

3) Fine Aggregate:

Robo sand & river sand is used as fine aggregate with specific gravity 2.51 & 2.59 respectively. The robo sand used in this research work was obtained from the stone quarry.

4) Cembinder:

Cembinder used in this project is cembinder 17 manufactured by akzonoble. Containing Sio_2 40% by weight & specific gravity is 1.001, ph is 9.0

B. Procedure

M20 grade concrete mix is designed as per BIS 10262-2009 and a total of 5 mixes were made with varying cembinder proportion of 0%, 1% ,5%, 8% and 10%. w/c ratio and super plasticizer were kept constant at 0.6,river sand and robo sand were used 50% each in all mixes as fine aggregates. Maximum size of aggregate was 40mm.coarse aggregate used was graded with 60% 40mm, 20% 20mm & 20% 10mm in all mixes.90mm slump was observed in all mixes. Oiling and waxing of moulds is done before filling the concrete in to the moulds. The concrete was filled in moulds of dimensions 150x150x150 (cm).

compaction was done with the help of table vibrater. After demoulding, the concrete was set to dry for 24 hours. Curing was done in curing chamber. Compressive strength was tested for 7,14 &28 days respectively.

C. Proportions

M20 grade concrete mix was designed as per BIS 10262-2009 with w/c 0.6 in all mixes and then using it we proportioned the cembinder of different variations i.e 0%,1 %, 5%, 8% & 10% by weight of the cement. Water and cement content decresed as cembinder percentage increased to maintain the slum of 90mm in all mixes.

Fig.1 UTM

Fig.3 Concrete Cubes

Fig.4 Crmbinder 17

D. Tests

1) Compressive Strength Test

The compressive strength attained by the cembinder 17 are as follows

Table.1 Compressive Strength Test

w/c ratio	SP	Cembinder Percentage	Compressive Strength (N/mm^2)		
			7 days	14days	28days
0.6	0.6%	0%	19.07	24.40	28.36
0.6	0.6%	1%	24	31.50	35
0.6	0.6%	5%	25.12	33.85	37.61
0.6	0.6%	8%	21.35	25.28	28.17
0.6	0.6%	10%	14.53	20.13	22.36

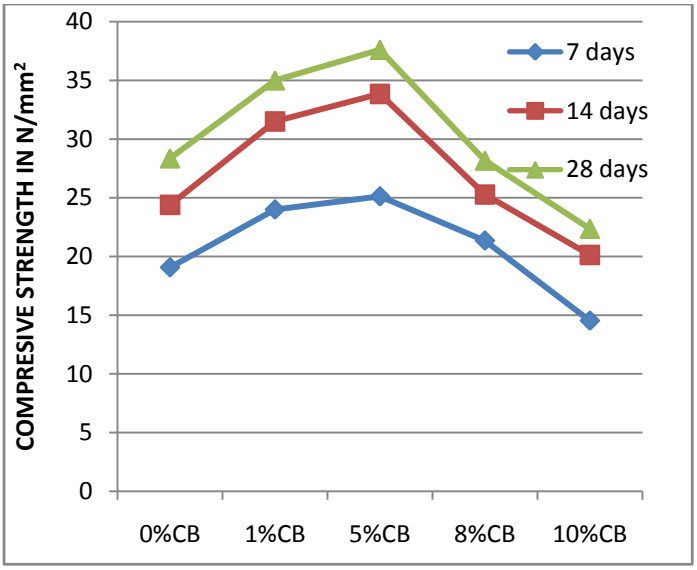

Fig. 5 Graph

III. CONCLUSION

This research work is concerned with studying the effect of cembinderon compressive strength of concrete. 5 mixes were made with varying proportion of cembinder and each mix was tested at 7 days, 14days & 28 days. From this study it is concluded that:

1- Compressive strength of concrete definitely increased by usage of cembinder as admixture.

2- Highest compressive strength i.e 37.61 N/mm^2 was obtained in concrete containing 5% cembinder.

3- The application of cembinder should be limited as variations of 8% and 10% did not increase the strength of concrete, this is due to excessive increase in workability, placeablity, finishablity and decreased cohisiveness within the concrete mix . therefore it is recommended to use limited amount of cembinder in concrete.

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REFERENCES

[1] H. Du, S. Du, X. Liu, Durability performances of concrete with nano-silica, Const. Build. Mater. 73 (2014) 705–12

[2] A. Porro, J. Dolado, I. Campillo, E. Erkizia, Y. De Miguel, Y. De Ybarra et al. Effects of nanosilica additions on cement pastes. In: R.K. Dhir, M.D. Newlands, L.J. Csetenyi (Eds.), International Conference on Applications of Nanotechnology in Concrete Design, Thomas Telford, Scotland, 2005, pp. 87–96

[3] J. S. Belkowitz, D. Armentrout, An investigation of nano-silica in the cement hydration process. In: 2010 Concrete Sustainability Conference, National Ready Mixed Concrete Association, Dubai, 2010, pp. 1-13

[4] J. J. Gaitero, I. Campillo, A. Guerrero, Reduction of the calcium leaching rate of cement paste by the addition of silica nanoparticles. Cem. Concr. Res. 38 (8,9) (2008) 1112–8.

[5] N. Zabihi, M. H. Ozkul, The effect of colloidal nano-silica as a cementitious material, on durability and mechanical properties of mortar, In: 11th Int. Congress on Advances in Civil Engineering (ACE 2014) Istanbul, 2014.

[6] BIS 10262-2009 M20 grade concrete mix desin

[7] .BIS 8112-1989 compressive strength test of cement

[8] .BIS 383.1970 Sieve analysis of coarse aggregate.

[9] Specific gravity of cement (BIS:4031- 1988)

[10] Cement setting time test (BIS: 4031 (part 5)- 1988)

[11] Specific gravity test of aggregate:(BIS 2386-PART-3-1963)

[12] Impact test of coarse aggregate: (BIS 2386 (PART 4) -1963)

[13] Crushing test of coarse aggregate : (BIS : 2386 (PART 4) – 196