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Original Research Paper

Engineering

STRENGTH EVALUATION OF HIGH STRENGTH CEMENT CONCRETEUSING ALCCOFINE 1203

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ABSTRACT

The use of HSC for construction, especially for multi-story buildings, has become very common in industrialized and developing countries. Also, the production of cement involves emission of large amounts of carbon-dioxide gas into the atmosphere, a major contributor for green house effect and global warming, hence it is inevitable either to search for another material or partially replace it by some other material. The objective of this study was to study the properties of Alccofine 1203 used for High performance concrete, to design the High Strength Concrete of M-80 with Alccofine 1203, to study the effect of Alccofine 1203 used in concrete to reduce water demand and providing high strength concrete and to determine the workability of High Performance concrete. The replacement of 15 % of cement with Alccofine 1203 shows slightly decline in the compresses power of the cubes for seven days and twenty eight days testing but the workability of concrete goes on rising side when compared with the results of concrete mix prepared with 10% replacement of cement with Alccofine 1203. Concrete mixed with Alccofine 1203 is eco-friendly, non-hazardous as it easily gets dispersed in concrete mix.

KEYWORDS :

INTRODUCTION

To achieve the high durability and more strength for the concrete, high performance concrete is required. Basically, the Concrete is most broadly used construction material in the world. After the water, it is second heavily consumed substance in the world, with six billion tonnes production every year. Concrete is basically made of aggregates, cementitious materials and water. These all primary constituents of concrete have an environmental impact and having different sustainability issues. The current concrete production process is not sustainable because, not only it is consuming huge quantities of aggregates and water, but also consumes significantly amount of Portland cement. The production of Portland cement consumes very large amount of energy and release CO2 in the environment, which cause global warming. Currently global warming is the most serious issue of environmental and all economic and political debates are based on sustainability issue. After seeking these environment impacts of concrete and sustainability as current motive of the world, the construction industry has to find out different ways to reduce the use Portland cement, natural aggregates and drinking water. To resolve this problem sustainable method is, to use large amount of industrial waste as substitute of aggregates and Portland cement.

- Contraction in the size of the columns
- Haste of construction
- More efficient rather than steel concrete
- Workability and pump ability
- Increased durability in aggressive situation
- Working lifespan is exceeding 100 years
- Huge tensile power
- Dwindle the cost

High-performance concrete (HPC) is expected to have performance characteristics exceeding those of conventional concretes. As in High Performance Concrete high compressive strength is required to achieve the high strength, for this purpose, water cement ratio has to be reduced. Generally, by reducing the water cement ratio, the workability of concrete will be reduced. So by this reduced workability it will be difficult to pump the concrete. The objective of the study is to design HPC, M80 using Alccofine 1203.

Materials Used

1. OPC 53 grade
2. Admixture SKY8866

Characteristics and advantages of SKY 8866 Admixture:-

- Reduction of vibration and decreased labour cost
- Pointed raise in early & ultimate power.
- Larger E modulus
- Enhanced resistance to reinforcing and stressing steel
- Good adhesion to carbonation and some other aggressive atmospheric environment
- Lesser permeability -enhanced long-lasting process.
- Decreased shrinkage with creep.

Performance Test Data of SKY 8866 Admixture.

Sr.No.	Performance Test Data	
1.	Aspect	Light Brown Liquid
2.	Relative Density	1.08 ± 0.01 at 25°C
3.	pH	≥6
4.	Chloride Ion Content	<0.2 %

Properties of Alccofine 1203

Sr.No.	Properties of Alccofine 1203	Unit	Values
1.	Average Partical Size	Microns	4 to 6
2.	Fineness	cm^2/gm	12000
3.	Specific Gravity	-	2.86 ± 0.02
4.	Bulk Density	kg/m^3	600 to 700

MATERIAL TESTING AND PROCEDURES

CONSISTANCY

Ideal consistency of a concrete paste is represented with the consistency which will allow the vicatplunger has 10 mm diameter and 50 mm length to stab to a depth of 33-35 mm from the peak of the mould. Computed Instruments used for Consistency Test of Concrete:-

1. Name of Instrument- Vicat Apparatus
2. Weight Balance Machine - 1000 Grams
3. Measuring Cylinder - 100 ml
4. Environmental Conditions - Temperature 27 ± 2°C and Humidity 65 ± 5%

Consistency Test of Cement

Sr.No.	Quantity of Cement (gms)	Quantity of Water (gms)	Needle Penetration (mm)	$P = w_2/w_1 * 100$ (%)
1.	400	100	20	25
2.	400	108	22	27

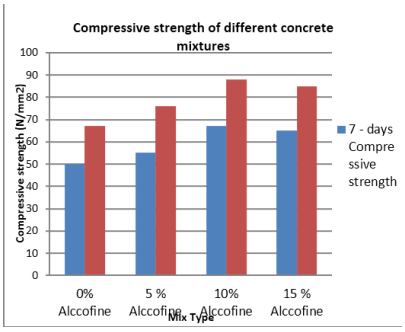
3.	400	120	25	30
4.	400	128	31	32
5.	400	132	34	33

Standard consistency (p) normally ranges from 25 – 36%
$P=w_2/w_1*100$
P=132/400*100=33%
Standard consistency=33%
W^1=weight of cement taken
W_2=weight of the water added for desired penetration
P=% of water for normal consistency.

MIX DESIGN

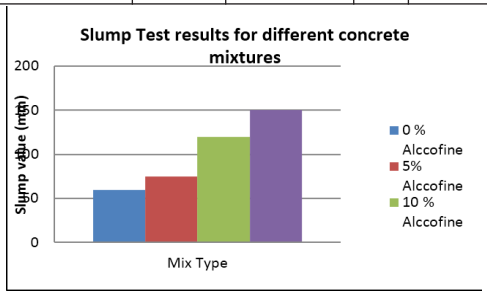
IS 10262 (2009): Guidelines for concrete mix design. This edition was appeared in 1982. With the starting reviews, the reliable changes have been applied:-

- The edition's title should be changed as 'Concrete mix proportioning - Guidelines' from the previous title 'Recommended guidelines for concrete mix design'.
- The appearance of the edition has been subjected for general and basic cement.
- Different needs have been changed in line with the needs of IS 456: 2000 'Plain and reinforced concrete - Code of practice *(fourth revision)'*.
- The demand for the choice of water-concrete proportional, water volume and guessing of coarse aggregate volume and fine aggregate volume have been revised and similarly changed. Accordingly, different needs like trial mixes, elaborative illustrations, etc, has revised and changed.
- Newly example of cement mix ratio by using fly slag as one of the important material, which has been mixed.
- Adding the air volume in basic (non -air entrained) cement is not of much implication in mixture proportion process and not a part of IS 456 : 2000, the volume of air should be deleted.
- Indian Standard Recommendations Method of Mix Design (IS 10262-1982)
- Target Mean Strength for Mix design : The Target Mean Compressive Strength at 28 Days is following :-



Slump test results for different concrete mixtures

Sno.	Mix Type	Alccofine %	Super plasticizer %	W/c ratio	Slump value (mm)
1.	0% Alccofine	0	0.8	0.27	60
2.	5% Alccofine	5			75
3.	10% Alccofine	10			120
4.	15% Alccofine	15			150



Slump test results for different concrete mixtures

Calculation of cement content
Cement by mass = Water content / (w/c ratio)
Calculation of aggregate content

$V=[W+C/S_c+f_a/P\,S_{fa}]/1000$
$C_a=(1-P)f_aS_{ca}/(PS_{fa})$
Where V=absolute volume of fresh concrete
W=mass of water (kg/m^3)
C=mass of cement (kg/m^3)
S_c=specific gravity of cement
P= ratio of fine aggregate. to total aggregate.
f_a,C_a= total mass of fine aggregate and coarse aggregate (kg/m^3)
S_{fa},S_{ca}= specific gravity of saturated, surface dry fine aggregate and coarse aggregate respectively.

CONCLUSION

- In this study, the usage of amalgamate of little particle (Alccofine 1203) contributes to the huge power workable concrete. In HPC Fly slg, silica fume and superplasticizer are essential constituents to produce huge power concrete. So to make the enduring HPC, it is must to have a mixed design with appropriate curing. In this study water cement ratio and SKY 8866 admixture ratio is restricted to 0.27% and 0.8% respectively.

- The replacement of 5% of Cement with Alccofine 1203 Shows slightly increase in compresses power of the cubes for seven days and twenty eight days testing and also shows an slightly improvement in the workability when compared with the results of concrete mix without use of Alccofine 1203.

- The replacement of 10% of Cement with Alccofine 1203 Shows huge increase in compresses power of the cubes for seven days and twenty eight days testing and improve the workability when compared with the results of concrete mix prepared with 5% replacement of cement with Alccofine 1203.

- The replacement of 15 % of cement with Alccofine 1203 shows slightly decline in the compresses power of the cubes for seven days and twenty eight days testing but the workability of concrete goes on rising side when compared with the results of concrete mix prepared with 10% replacement of cement with Alccofine 1203.

- Concrete mixed with Alccofine 1203 is eco-friendly, non-hazardous as it easily get dispersed in concrete mix.

- The price of OPC 53 grade in market is 350 Rs per bag (50 Kg) i.e. Rs. 7 per Kg and the price of Alccofine 1203 in market is Rs 150 per bag (25 Kg) i.e Rs. 6 per Kg, It comes out the cost of concrete per cubic meter is reduced to 1.4% when cement is replaced with 10 % of alccofine.

- High durable concrete achieved through the use of supplementary cementitious materials will decrease the maintenance cost of structure. Thus life cycle cost will decrease.

REFERENCES

1. Adesanya, D. A. and Raheem A. A. (2009). "A Study of the Workability and Compressive Strength Characteristics of Corn cob Ash Blended Cement Concrete", Construction and Building Materials, Vol. 23, pp. 311 – 317
2. Adam NevilleA. and M. Neville Engineering, Pierre-Claude Aïtcin Department of Civil Engineering, Université de Sherbrooke.
3. Adesanya, D. A. and Raheem A. A. (2010)."A Study of the Permeability and acid attack of Corn cob Ash blended Cements", Construction and Building Materials, Vol. 24, pp.403 – 409.Agboire, S., Wada, A. C. and Ishaq, M. N.:Evaluation and Characterization of Sugarcane Germplasm Accessions for their Breeding Valuesin Nigeria, The Journal for Food Technology In Africa, Vol. 7, No 1, pp. 33-35., 2002.
4. Aigbodion, V. S, Hassan, S. B, Ause, T. and Nyior, G. B.: Potential Utilization of Solid Waste (Bagasse Ash), Journal of Minerals & Materials Characterization & Engineering, 9, pp. 67-77, 2010
5. ASTM Standards, Concrete and Mineral Aggregates Section 4 Volume 04.01, cement, Lime,Gypsum and Section 4, Volume 04.02, USA,1985.
6. Baguant, K.: Properties of Concrete with Bagasse Ash as Fine Aggregate, International Conferenceon Fly Ash, Silica Fume, Slag and NaturalPozzolans in Concrete,153 (18), pp. 315- 337,1995.
7. Balendran, R. V. and Martin – Buades, W. H. (2000)."The Influence of High Temperature Curing on the Compressive, Tensile and Flexural Strength of Pulverized Fuel Ash

Concrete", Building and Environment, Vol. 35 No. 5, pp.
8. British Standard 12:112: Specifications for Aggregate Type, British Standard Institution, London, 1996.
9. Durability of Building Materials and components Goodspeed et al., 1996 .
10. Federal Highway Administration Research and Technology Publication Number: FHWA-RD-97-030Date: 1989-1994
11. G.C. Cordeiro, R.D.ToledoFilho, L.M. Tavares, E.M.R. Fairbairn, "Pozzolanic activity and filler effect of sugarcane bagasse ash in Portlandcement andlimemorters", Cement and Concrete composites, vol. 30, pp410-418, 2008.
12. Karen A. Knudsen, Alejandro Peralta Soler, Keith R. Johnson,* and Margaret J. Wheelock
13. M.A. Rashid and M.A. Mansur / Journal of Civil Engineering (IEB), 37 (1) (2009) 53-63
14. NuntachaiChusilp, Chai Jaturapitakku, KraiwoodKiattikomal, "Utilization of bagasse ash as a pozzolanic material in concrete", Construction &Building Materials, vol.23, pp 3352-3358, 2009.
15. P.Vinayagam, 2012 Experimental Investigation on High Performance Concrete Using Silica Fume and Superplasticizer International Journal of Computer and Communication Engineering, Vol. 1, No. 2, July 2012.
16. Patil.B. B,Khumbar P.D. 2012 Strength and Durability Properties of High Performance Concrete incorporating High Reactivity Metakaolin. International Journal of Modern Engineering Research (IJMER). Vol.2, Issue.3, May-June 2012 pp-1099-1104.
17. Soni, D., Kulkarni. S., Parekh, V. (2013), "Experimental Study on High-Performance Concrete with Mixing of Alccofine and Flyash", Indian Journal of Research, Vol. 3 (4), pp. 84-86.
18. Nayak, P., Narashimhan, H.S., Kadaba, R.V. (2014), "Hardened Properties of Concretes made with Micro Silica and Alccofine - A Performance Optimization based Comparative Study", International Journal of Engineering Research and Development, Vol. 10 (8), pp. 1-9.
19. S, Rajesh Kumar., Samanta, Amiya K., Roy, Dilip K. Singha. (2015), "An Experimental study on the mechanical properties of Alccofine based high grade concrete", International Journal of Multidisciplinary Research and Development, Vol. 2 (10), pp. 218-224.
20. Reddy, A Narinder., Meena, T. (2017), "An experimental investigation on mechanical behaviour of Eco-friendly Concrete", IOP Conference Series: Materials Science and Engineering, Vol. 263, pp. 1-9.