A REVIEW ON EFFECT OF MINERAL ADMIXTURES ON PROPERTIES OF SELF-COMPACTING CONCRETE

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Abstract- The present study includes self curing concrete and its property. The workability properties of SCC such as filling capability, passing ability and segregation struggle are evaluated using workability tests such as slump flow, V- funnel and L-Box tests. In this work attempt has made to study effect of diverse proportion of mineral admixture in the mix design and find out optimum percentage of mineral admixture that is silica fume (SF), marble powder (MP), fly ash, Pozzolana with maximum power criteria. This study includes the relation between different parameters of concrete such as workability, compressive strength & flexural strength as economically as probable as concrete mix design for self-compacting Concrete

Keywords-Self Compacting Concrete, Mineral admixtures, Compressive Strength.

I. INTRODUCTION

The combination composition of SCC deviates from conventional concrete. SCC has recently been used in the pre–cast industry and in some profitable applications, however the moderately high material cost still hinders the wide spread use of such specialty concrete in various segments of the building industry, including commercial and housing construction. SCC is a high feat concrete that consolidates under its self-weight, and adequately fills all the voids without segregation, excessive bleeding or any other division of materials, without the need of emotionless consolidation. The key property of SCC is filling ability, passing ability and resistance to segregation. Filling ability helps SCC to flow through the formwork and completely fill all the spaces within it, because of its special fluidity, SCC requires modified fresh concrete testing methods compared with conventional concrete. The difficulty consists of the fact, that SCC is very responsive to deviation of combination.

2. PREVIOUS WORK

Bui V.K.et al. (2002) Discussed a speedy method in order to test the resistance to segregation of Self-compacting concrete. Extensive test programme of SCC with different water-binder ratios, paste volumes, combinations between coarse and fine aggregates and various types and contents of mineral admixtures was carried out. The test was helpful in concluding the method along with the apparatus used for examining the segregation resistance of SCC in both the directions.

Xie Youjun et al. (2002) Presented the preparation technology of high strength self- compacting concrete (SCC) containing fly ash and superplasticizer (SP).Various parameters of concrete were selected namely good workability, high mechanical properties and high durability and SCC was developed. There was low slump loss in the fresh SCC mixture.

Tande et al.(2007) Self-Compacting Concrete (SCC) technology can save time, cost, enhance quality, durability and moreover it is a green concept. Due to its ability to guide itself into every nook and cranny in the form, SCC can produce nearly nil defects concrete. Number of pouring points can be reduced, thus eliminating the cumbersome activity of pipe laying over the pour. The number of skilled supervisors, engineers, vibrator operators and pipe fitters can drastically be reduced. Formwork can be used for more number of times. Cost of repairing the structure is reduced as the numbers of defects are reduced to a great extent. Since the concrete is capable of self-consolidating and reaching the difficult areas in moulds, manual variables in terms of placing and compacting concrete is nil. This factor ultimately yields defect less, better-quality concrete structures.

Mehmet Gesoglu et al. (2007) Studied Effects of mineral admixtures on fresh and hardened properties of self-compacting concretes.He studied total 22 concrete mixtures having a constant water/binder ratio of 0.32 and total binder content of 550 kg/m^3.Test results have revealed that incorporating the mineral admixtures improved the fresh properties and rheology of the concrete mixtures. The compressive strength and electrical resistivity of the concretes with SF and GGBFS were much higher than those of the control Concrete.

Khatib J.M.(2008) Investigated the properties of self compacting concrete prepared by adding fly ash (FA). FA was used as a replacement for Portland Cement (PC). PC was replaced 0-80% by fly ash. For all the mixes water binder ratio was maintained as 0.36.Strength properties as well as the workability, shrinkage, absorption and ultrasonic pulse velocity were studied in this research. From the observations it was concluded that 40% replacement of FA resulted in strength of more than 65 N/mm^2 at 56 days.

Miao Liu (2010) This research investigated self-compacting concrete (SCC) with levels of up to 80% cement replacement by fly ash in mixes adjusted to give constant fresh concrete properties.The hardened concrete and the relationships between hardened properties were then studied. The results show that SCC with up 80% cement replaced by fly ash is possible. To keep the filling ability constant, replacement of cement with fly ash would require an increase in water/powder (W/P) ratio and a reduction in superplasticiser dosage. They also show fly ash have negative effects on passing ability ,consistence retention and hardened concrete properties such as strength.

Mucteba Uysal et al. (2011) In this study, the benefits of limestone powder (LP), basalt powder (BP) and marble powder (MP) as partial replacement of Portland cement are established. Furthermore, LP, BP and MP are used directly without attempting any additional processing in the production of self-compacting concrete (SCC). The results show that it is possible to successfully utilize waste LP, BP and MP as mineral admixtures in producing SCC. Due to its observed mechanical advantages, the employment of waste mineral admixtures improved the economical feasibility of SCC production on a unit strength basis.

Heba et al.(2011) Presented an experimental study on SCC with two cement contents; the work involved three types of mixes, the first considered different percentages of fly ash, the seconds used different percentages of silica fumes and the third used mixtures of fly ash and silica fume.It was concluded that higher the percentages of fly ash the higher the values of concrete compressive strength until 30% of FA, however the higher values of concrete compressive strength is obtained from mix containing 15% FA.

Belaidi.et al. (2012) Shows that use of both natural pozzolana and marble powder by substitution to cement has no negative effects on the workability of SCC. However, a not much reduction of compressive strength was observed with natural pozzolana and marble powder addition, compared to TC.

Said Kenai et al. (2014) It is possible to manufacture self-compacting concrete using Algerian mineral admixtures with acceptable fresh and hardened properties. The use of limestone powder and Slag allows increasing the fluidity of the SCC mixture but it affects negatively its stability. An improvement of workability was observed with workability gain up to 90 min. Which make them very beneficial for concreting in hot weather.

Anand N et al. (2016) In the present investigation, an attempt has been made to study the effect of elevated temperature on mechanical properties of SCC specimens made with different mineral admixtures that were heated from 27 to 900 °C and cooled by air or water. Silica fume, flyash, metakaolin were used as mineral admixtures. Reductions were found for the SCC specimens made with silica fume and flyash. Microstructure investigation has been carried out on SCC samples using scanning electron microscope and X-ray diffraction analytical techniques to understand the effect of temperature on decrease in strength.

Srishaila Jagalur Mahalingasharma et al. (2017) This paper presents experimental investigations made on the influence of chemical, physical, morphological and mineralogical properties of mineral admixtures such as fly ash, ground granulate blast furnace slag, metakaoline and micro silica used as a replacement of cement in self compacting concrete on workability and compressive strength. The self compacting concrete tested for slump flow, V-funnel, L-Box, J-Ring, T50, and compressive strength on concrete cube were determined at age of 3, 7, 28, 56, 90 days. The workability of concrete depends on other factors such as specific gravity, shape, size, specific surface of mineral admixtures.

Abdullah Mohsen Ahmed Zeyad et al.(2017) This paper discusses the results of an experimental investigation on the properties of SCC and self-compacting fiber reinforced concrete (SCFRC) mixtures with the inclusion of polypropylene fibers (PFs) and containing FA at replacement rates of 0%, 20%, 40%, and 60 % cement mass. The compressive, flexural, and split tensile strengths of the prepared concrete samples were investigated at ages of 7, 14, 28, and 90 days. The workability of fresh concrete mixtures was also studied through segregation, bleeding, slump flow, slump flow T50, L-box V-funnel T5, and V-funnel tests. Results showed that the best properties of fresh SCCs were obtained when FA was added at replacement rates of 20% and 40% cement mass.

CONCLUSION

1. About 40 to 50% of cement content can be replaced by supplementary cementing material like fly ash so, cost of the self compacting concrete is greatly reduced.
2. Incorporation of mineral admixtures reduced the cost per unit compressive strength of these SCC mixtures, for all investigated cases. The reduction was

approximately 0.1 $/MPa/m^3 for Marble powder 30%, which is the most economical mixture among the entire SCC series.

3. The best SCC workability was obtained when Fly Ash was added at replacement rates of 20% and 40% cement mass without PFs. Fresh SCC samples with this formulation exhibited slump flow diameters of 73 cm and 70 cm; blocking ratios of 0.86 and 0.88; and flow times of 5.2 to 5.3 s. FA should be utilized to produce SCC with high strength at 90 days.

4. Use of fly ash in self compacting concrete increases in slump flow compared other series replacement of mineral admixtures.

5. Higher compressive strength has been obtained by 30% replacement of cement by ground granulated blast furnace slag and 10% of Silica fume series is 49.12 MPa at 28 day and this is equal to control mix. Also the increase in replacement levels has resulted in decrease in strength.

6. The binary use of FA or GGBFS with ordinary PC significantly prolonged the initial and final setting times of the SCCs. mineral admixtures enhanced the electrical resistivity of the concretes with increasing cementitious materials content. The maximum electrical resistivity of about 25.8 kohm-cm was achieved for the concrete with 45% GGBFS and 15% SF.

7. The effect of UPFA on fresh concrete is to improve the viscosity of fresh concrete, and its effect is the same as that of a viscosity agent. It does not decrease the flowability. SCC with ultrapulverized fly ash has higher mechanical properties, excellent permeability and freezing resistance, and lower drying shrinkage.

8. The use of MP content (5–30%) enhances the rheological properties of both mortar and concrete. However, a reduction of compressive strength was observed with PZ and MP addition compared to control concrete. PZ in binary systems increases the strength at long term (90 days).

9. The incorporation of Pozzolana from a natural Source in Algeria is very beneficial in reducing the permeability properties of SCC. sorptivity, chloride diffusion and permeability are less important for SCC than for the corresponding OVC. The difference increases with the decrease in compressive strength.

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