



A STUDY ON PROPERTIES OF CONCRETE MADE USING SILICA FUMES

¹Ritesh Kumawat, ²Shikher Turki, ³Prateek Goya, ³Prateek Goyal, ⁴Umesh Malav, ⁵Upendra Singh Panwar, ⁶Vikas Kumar Meena, ⁷Akhil Maheshwari, ⁸Dr.Omprakash Netula

¹²³⁴⁵⁶B.Tech Final Year Students, ⁷Asst. Professor, ⁸Professor & HOD, Department of Civil Engineering, Jaipur Engineering College and Research Centre, Jaipur, Rajasthan, India

Abstract: Increase in the utilization of materials required in the creation of cement has lead to consumption of materials. Silica smolder is non metallic and non unsafe misuse of enterprises. It is appropriate for solid blend and improves properties of cement for example compressive quality and so on. The principle target of this explore work is to decide the ideal substitution rates which can be appropriately utilized under the Indian conditions. When appropriately planned and put, silica fume delivers a top notch concrete. Silica seethe concrete is of enthusiasm as it has a high early quality improvement, high extreme quality, great scraped spot obstruction and great protection from freeze-defrost activity. In lab considers, 28-day compressive qualities more than 14 000 Ibjin2 (97 MPa) were effectively acquired utilizing silica seethe with typical measures of portland concrete.

Index Terms – Silica Fume, OPC, Blended Cement.

I. INTRODUCTION

Mineral admixtures are widely used in concrete for various reasons specially for reducing the amount of cement content required for making concrete, which reduces construction cost. Durability of portland cement concrete is defined as its ability to resist weathering action, chemical attack, abrasion, fire or some other process of deterioration. Also, it has been of great interest over the last few decades. Silica fume is also known as micro silica, volatized silica or silica dust. Silica fume has been recognized as a pozzolanic admixture that affects the mechanical properties to a great extent.

Addition of silica fume to concrete improves the durability of concrete and also protecting the embedded steel from corrosion. This occurs due to the reaction between the amorphous silica of the pozzolanic and the calcium hydroxide produced by the cement hydration reactions. Concrete containing silica fume have very high strength and are very durable. In this paper the advantages of using silica fume as a replacement of cement in concrete are determined. The present experimentation has been carried out to determine the mechanical properties of conventional concrete and concrete using silica fume. Suitability of silica fume has been found out by research.

II. RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The blend structure for the M45 evaluation of cement was done based on rules gave by IS 10262-2009 and IS 456-2000. The tried droop was chosen as 100 and water concrete proportion of 0.4 was kept consistent. After numerous preliminaries, in view of solidarity and functionality, the last blend extent for control blend was 1:1.68:2.79: 0.4 with concrete substance being 410kg/m³ was chosen. To consider the impact on solid blend because of silica vapor, different blends were proposed with shifted extents of silica seethe and an examination was led for around 56 days.

The test study was completed in the following sequence :

- i. Determination of specific gravity of silica fume.
- ii. Mixed design calculations to determine the proportions and quantity of different constituent materials.
- iii. Casting of concrete cubes each for different percentages of silica fume.
- iv. Demoulding concrete cubes after 1 day of casting.
- v. Leading Ultrasonic Pulse Velocity test, Rebound Hammer test and erosion resistivity meter test following 28 days of throwing.
- vi. Interpretation of data collected after conducting different tests to analyze strength and durability aspects.

III. MATERIALS

3.1 Cement

It is fine powder with cement properties and goes about as cover in the solid blend. Standard Portland concrete of 43 evaluation concrete was utilized our examination. The Slump Test and Density Test were done.

3.2 Silica Fume

Silica seethe is likewise called as small scale silica and utilized mineral admixture in concrete. In the present examination, the silica fume utilized was acquired from "Adinath Industries", Ajmer, India.

3.3 Aggregates

These are auxiliary segment to the solid. Total underneath 20mm size are utilized with respect to solid blend. All around evaluated totals are utilized to limit the voids in concrete and require least concrete glue to fill in the voids. There are two kinds of totals for example fine totals and coarse totals which has been utilized in our investigation.

3.4 Super Plasticizer

These are substance admixture other than the water, total and concrete which is added to the solid during blending. These would influence the setting and Hardening attributes for concrete glue. "hs200 super plasticizer" was utilized right now.

IV. RESULTS AND DISCUSSION

4.1 Slump Test

The impacts of silica fume when added to the solid as substitution of concrete on the usefulness trademark is appeared beneath graphically. As the level of silica seethe increments from (0% - 12.5%) the droop diminishes from 100 to 72mm. The decrease in droop is because of the particles size, surface territory and size of silica seethe molecule which is exceptionally littler than concrete particles and it requires more water than concrete alone for a given droop.

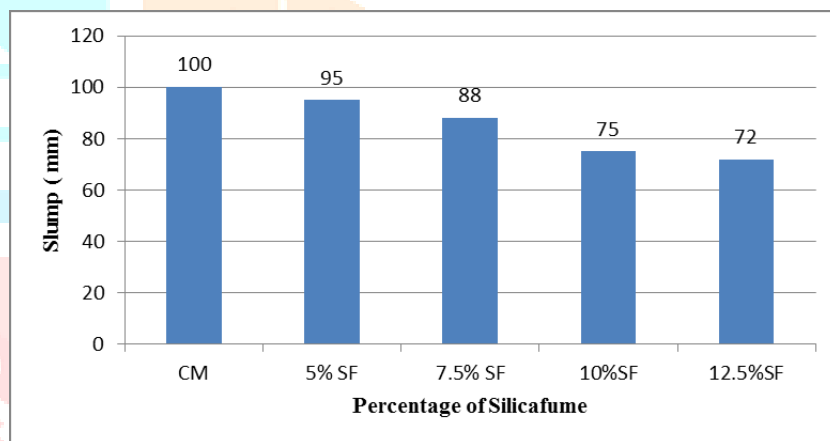


Fig 4.1 Graph For Slump Test

4.2 Density

The thickness test was done to know the conservativeness of the solid. It principally relies on the compaction of the solid. From the above Fig it is seen that the thickness got for the control blend is 25.46 kN/m³. The expansion of silica fume will in general diminish the thickness of the solid. The thickness we got for 5%, 7.5%, 10% & 12.5% of silica vapor is demonstrated as follows.

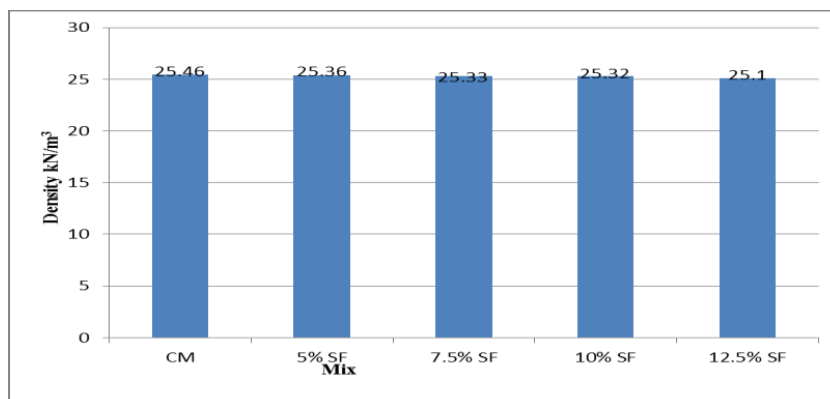


Fig 4.2 Graph For Density Test

V. CONCLUSIONS

From the outcomes it is presume that the silica fume is a superior substitution of concrete. The pace of solidarity gain in silica smolder concrete is high. In the wake of playing out all the tests and breaking down their outcome, the accompanying ends can be inferred:

i. With the increase in w/cm ratio strength of concrete decreases.

ii. The optimum value of compressive strength can be achieved in 10% replacement of silica fume.

iii. As strength of 15% replacement of cement by silica fume is more than normal concrete. The optimum silica fume replacement percentage is varies from 10 % to 15 % replacement level.

iv. Workability of concrete decreases as increase with % of silica fume.

v. Compressive strength decreases when the cement replacement is above 15% of silica fume.

VI. REFERENCES

[1] Nehdi M., Hayek M.: Cem.Concr.Res. 35, 731 (2005).

[2] Mohamed s. Morsy, Sayed s. Shebl, Effect of silica fume and metakaoline pozzolana on the performance of blended cement pastes against fire, Ceramics - Silikáty 51 (1) 40-44 (2007)

[3] S.Bhanja, B Sengupta, Influence of silica fume on the tensile strength of concrete, Cement and Concrete Research,35(4), 743–747(2005)

[4] N. K. Amudhavalli, Jeena Mathew, Effect of silica fume on strength and durability parameters of concrete, International Journal of Engineering Sciences & Emerging Technologies, 3(1), 28-35(2012)

[5] Heba A.Mohamad, Effect of fly ash and silica fume on compressive strength of self-compacting concrete under different curing conditions, Ain Shams Engineering Journal, 2(2), 79–86 (2011)

[6] Mehta P.K. (1989) Pozzolanic and Cementitious by- products in Concrete Another Look, In V.M. Malhotra ed.Fly Ash, Silica Fume, Slag, and Natural Pozzolans in Concrete, Sp 114, Vol. 1, ACI, Detroit: 1-45

[7] Ali Behnood *, Hasan Ziari, Effects of silica fume addition and water to cement ratio on the properties of high-strength concrete after exposure to high temperatures, Cement & Concrete Composites 30 ,106–112(2008)

[8] Rajamane N. P., J.A. Peter, M.Neelamegam, J. K.Dattatreya and S. Gopalkrishnan, Studies on compressive strength and porosity of high performance concrete containing silica fume, proceeding of the National Seminar on High Performance Concrete, 22-23 may, Madras, pp TS1-TS10

[9] Lewis Robert and Siddappa Hasbi, Use of silica fume concrete: selective case studies, Indian Concrete Journal, pp645-652(2001)

