International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 6, September-October 2020 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Performance of Special Concretes at Elevated Temperatures

Paloji Rama Krishna[1], P. Hanuma[2]

[2]Assistant Professor, [1,2]Department of Civil Engineering,
[1,2]Sri Sunflower College of Engineering &Technology, Lankapalli, Andhra Pradesh, India

ABSTRACT

Concrete is constantly expected to be more grounded and more tough than before, while being cost and vitality effective. Also, the three significant preferences that solid has over other development materials must be moderated: the chance of being created basically anyplace; the capacity to take the structure forced by the state of a form; and minimal effort of the segments and the assembling. These elements have driven the advances in improving the presentation of cement over years, and keep on doing as such. The requirement for improving the presentation of cement and worry for the ecological effect emerging from the consistently expanding interest for concrete, has prompted the developing utilization of elective materials segment. It is currently certain that materials, for example, silica rage, rice quiet debris ,fly debris, ground granulated impact heater slag and metakaolin be delivered from plentiful regular material which are squander material must be utilized to halfway substitute concrete or to supplement it when elite is required.

The High Strength Self Compacting Concrete comprises of higher level of fines when contrasted with the traditional cement. So it has higher danger of spalling when presented to raised temperatures due its minimized smaller scale structure. In this examination the impact of raised temperature extending from room temperature to 600oC for various spans on the compressive quality and weight reduction of high quality self-compacting cement of evaluation M70 with Fly debris and Micro Silica as mineral admixtures. The blend extents are gotten based on NAN-SU blend plan. This plan depends on pressing variable (PF) of total and W/C proportion and FA/CA utilized are 0.25 and 52/48 for various Packing Factors. The water concrete proportion is considered from writing survey. Pressing element of total is characterized as the proportion of mass of total of firmly stuffed state in SCC to that of inexactly pressed state. Extents of Coarse total, Fine total, Fly Ash, Super plasticizer and water folio proportions are unique and extents of Cement, Micro Silica and VMA are steady for various Packing Factors. The rates of Micro Silica and VMA included are 7% and 0.3% for all blends.

How to cite this paper: Paloji Rama Krishna | P. Hanuma "Performance of Special Concretes at Elevated Temperatures" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-6, October 2020, pp.828-831, URL: www.ijtsrd.com/papers/ijtsrd33532.pdf

IJTSRD33532

INTRODUCTION

Concrete is a champion among the most adaptable and comprehensively used improvement materials. With the enthusiasm growing for reinforced strong structures in the propelled society to address the issues of new enhancements, extending masses and new forceful helper plan contemplations, the help in strong structures is winding up increasingly thick and bundled. The staggering and thick help can raise issues of pouring and compacting the strong. The strong must have the ability to pass the thick rebar strategy without blocking or segregating. The arrangement of such concrete is very trying since helpless position and the nonattendance of good vibratory compaction can incite the consolidation of voids and loss of long stretch durability of strong structures. This has been a concern for planners for quite a while.

In the midst of the latest decade, strong advancement has made a massive improvement through the introduction of self-compacting concrete (SCC). Self-compacting or self-joining concrete is a for the most part new period of predominant strong that can achieve astounding deformability and homogeneity in its fresh state, occupying all the space around the help, experiencing thick fortifying steel bars while compacting under its own load with no external vibration.

MATERIALS

Cement

In the present investigations Ordinary Portland cement of 53 Grade is used. Care should be taken that it is made from a single source and of same grade and it is stored in an air-tight container to prevent it from the atmospheric moisture and humidity. The cement thus produced was tested for physical properties in accordance with IS: 4031.

S.NO	Property	Result
1	Normal consistency	29%
2	Specific gravity	2.95
3	Initial setting time	95 minutes
4	Final setting time	220 minutes
5	Soundness of cement	3.5mm
6	Fineness of cement	4.47%
7	Compressive strength a. 7days b. 14days c. 28days	 21.194 N/mm^2 38.4 N/mm^2 53.58 N/mm^2

TABLE-1: Physical Properties of OPC 53 grade used

Sno.	Constituent	Percentage
1	CaO	63.70
2	SiO_2	22.00
3	Al_2O_3	4.25
4	Fe_2O_3	3.40
5	MgO	1.50
6	SO_3	1.95

Table-2: Chemical Properties of OPC 53 Grade

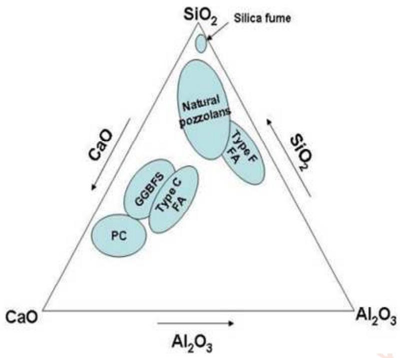

Fig-1: Composition of cement and mineral admixtures

Fig-2: Ground granulated blast-furnace slag (GGBS)

Fig.-3: Different forms of Micro Silica

Fig-4: Fly ash

SCC Mix Design

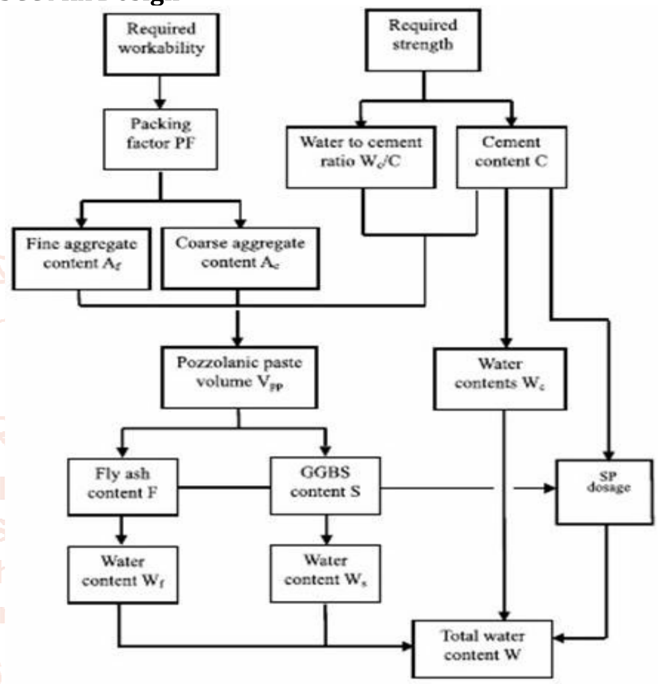

Fig.5: Flow chart of SCC Mix Design

Results and discussions:

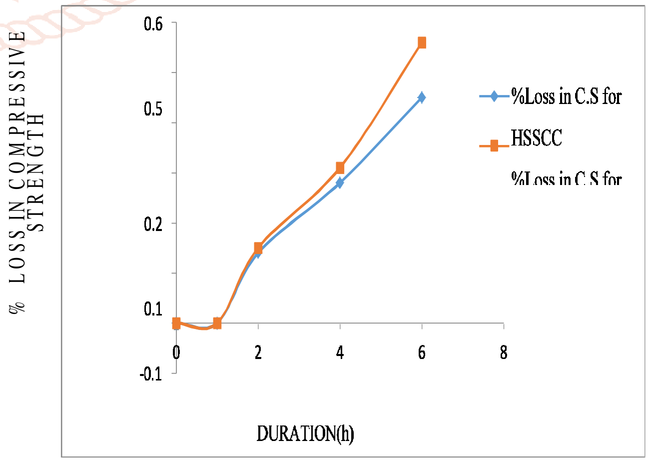

Fig.-6: Duration Vs %Loss in Compressive Strength of HSSCC and HSVC

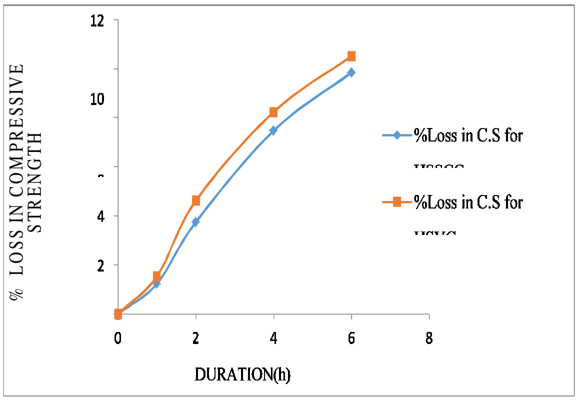

Fig-7:.Duration Vs %Loss in Compressive Strength of HSSCC and HSVC at 200^{o}C

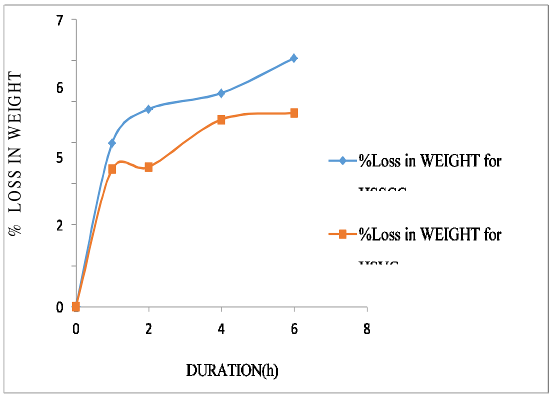

Fig-11: Duration Vs %Loss in Weight of HSSCC and HSVC at 400^{o}C

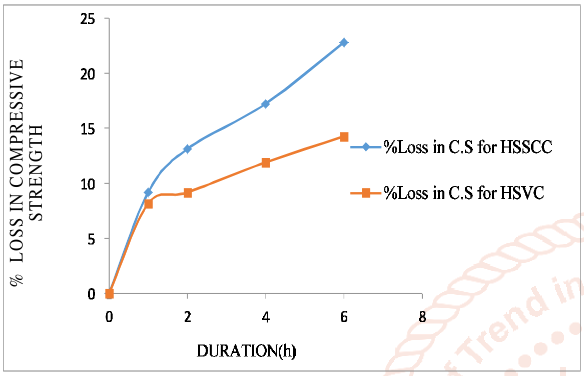

Fig-8: Duration Vs %Loss in Compressive Strength of HSSCC and HSVC at 400^{o}C

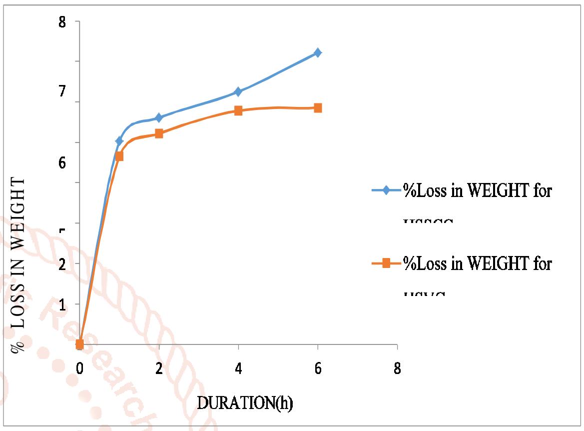

Fig-12: Duration Vs %Loss in Weight of HSSCC and HSVC at 600^{o}C

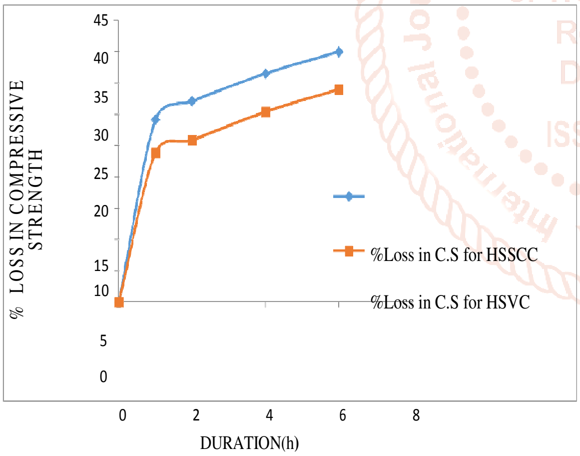

Fig-9: Duration Vs %Loss in Compressive Strength of HSSCC and HSVC at 600^{o}C

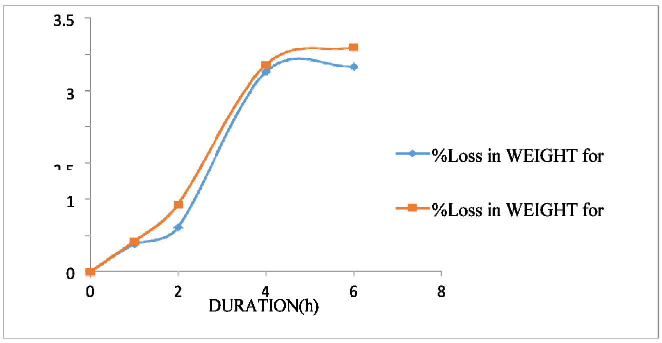

Fig-10: Duration Vs %Loss in Weight of HSSCC and HSVC at 200^{o}C

CONCLUSIONS

From the results presented in this paper using M70 self-compacting concrete with different Packing Factors for constant water cement ratio, the main conclusions are

- Required minimum slump is achieved for a Packing Factor of 1.14 with minimum strength for M70 grade high strength self- compacting concrete.
- Maximum strengths are achieved for a Packing Factor of 1.10 with optimum slump for M70 grade high strength self -compacting concrete.
- These values are obtained for a Water Cement ratio of 0.25 with addition of 7% micro silica.
- It is observed that when Packing Factor is less than 1.10 the mix requires more binders there by affecting the workability. Whereas when Packing Factor is more than 1.14 the required strengths and workability are not achieved.
- There is an increase in compressive strength with decrease in packing factor.
- All the workability factors for SCC are improved with decrease in packing factor from 1.14 to 1.10.

REFERENCES

[1] Okamura, H. and Ouchi, M. [1]"Self-compacting concrete". Journal of advanced concrete technology, 2003, Vol.1, No.1, pp 5-15.

[2] Nan Su, Kung –Chung Hsub and His-Wen Chai.[2] "A simple mix design method for self-compacting concrete". Cement and Concrete Research, 2001, Vol.31, pp 1799-1807.

[3] Subramanian, S. and Chattopadhyay D .[5] "Experiments for mix proportioning of Self – compacting concrete", The Indian Concrete Journal, 2002, pp.13-20

[4] V. Mallikarjuna Reddy, Dr. M.V Seshagiri Rao, [10] "Performance of High Strength Sel Compacted Concrete Exposed to elevated temperatures".

[5] Bai, Sharada Bai, Swamy, Jagadish (1998) "Effect of elevated temperature on high strength concrete", National seminar on advances in special concretes, 1998. pp 294-304.

[6] CelikOzyildirim, Stephen Lane D, "Measurement of properties of fresh self- compacting concrete "Final report, Europian Union Growth Contact No. G6RD-CT-2001-00580, September 2005 pp 1489 1496.

[7] Chi-Sun Poon et al. "Strength and Durability recovery of fire damaged concrete after post-fire-curing". Cement and Concrete Research. 2001. Vol.31, PP.1307-1318.

[8] Y. N Chan, G. F Peng and M. Anson, "Residual strength and pore structure of High strength concrete and normal strength concrete after exposure to high temperatures," Cement and concrete research, vol.31,no.9, pp.1291-1300,2001.

[9] Collepardi. M., "Self –compacting concrete: What is new? " Proceeding of the seventh CANMET/ACI Conference on Superplasticizers and other chemical admixtures in concrete, Berlin (Germany), 2003, pp. 1-16.

[10] Domone, P.L. "A review of the Hardened Mechanical properties of self-compacting concrete," *Cement and Concrete Composites*, 29, 2007, 1-12.

[11] Erica holt. "Self-Compacting Concrete", State of the art part iv, fire resistance. Technical Research Center of Finland, VTT Building and Transport, 2003, PP. 1-14.

[12] European Project Group, *Specification and guidelines for self-compacting concrete*, United Kingdom, EFNARC, 2002.

[13] Felekoglu, B. "Investigation on mechanical and physical properties of SCC," *M.Sc. Thesis in Civil Engineering*, DokusEylul University, Izmir, 2003.

[14] Felekoglu, B. and Sarikahya, H. "Effect of chemical structure of polycarboxylate-base superplasticizers on Workability retention of self-compacting concrete," *Construction and Building Materials*, 22, 2008, 1792-1980.