IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Study On Characteristic Strength Of Cellular Light Weight Concrete For Different Proportion Of Composite Material

Vikash Bhatt[1], Ms.NavjotKaur Bhatia[2]

[1] Research Scholar, Structural Engineering, Department of Civil Engineering, ShriShankaracharya Technical Campus BhilaiChhatisgargh.

[2] Assistant Professor, Department of Civil Engineering, ShriShankaracharya Technical Campus BhilaiChhatisgarh.

***Abstract*— The usage of cellular light weight concrete blocks in civil engineering gives a best solution to building construction industry. CLC Blocks gives a better solution to reduce the dead weight of the building. This paper gives an attempt to made, The study on characteristic strength of CLC based on different proportion of their composite materials and recommend as it can be used in construction industry. It also gives an idea about Ratio and Density by which CLC may characterise according to IS-2185 (PART-4) 2008.**

***Keywords*— Fly Ash, Cement, Chemical Foam, Water, CLC Technology.**

I. INTRODUCTION

CLC, Based on their economy, it becomes popular in recent years. CLC introducing best example of light weight concrete and gives tremendous advantages by reducing the dead weight of building. By introducing best result, CLC helps to modifying civil engineering construction in future.

This chapter used to describe the nature for foamed concrete, its composition, properties and how may be used in civil engineering works. Cellular light weight concrete is also termed as foamed concrete and can vary widely based on different proportion. Concrete with natural aggregate like coarse aggregate, fine aggregate, cement having dry density greater than 2200 kg/m^3 and introducing the highly dead load of structure. According to IS-2185 (PART-4) 2008, gives the standard for preformed foam cellular concrete blocks and introducing light weight concrete by density ranging from 800-2000 kg/m^3.

Cellular light weight concrete having advantages particularly Economy, Reduced weight, Termite Resistance, Low water absorption etc. It is characterised as low compressive strength and highly absorption of heat and sound. Due to lowerdensity (Light Weight concrete) these are used to reduce dead weight of the structure and these CLC Blocks may be used as masonry units for load and non-load bearing walls.

Information provided in this paper is for density between 800 kg/m^3 to 1100 kg/m^3, which comes into GRADE B classification.

II. MATERIALS AND BLOCK DIMENSIONS

Cement

OPC-53 grade cement is used in mixture having specific gravity 3.14 and confirming to IS-12269:1987.

Water

Potable water is used in manufacturing of CLC Cubes.

Fly-Ash

Fly ash, the bye-product from thermal power plants, is used which is confirming to IS-3812(PART-1). Fly ash collected from the NSPCL Bhilai Power Plant.

Foaming Agent

The container holding foaming agent must be kept air tight and under temperatures not exceeding 27^{o}c. Once diluted in 25 parts of potable water, the emulsion must be used soonest. The weight of foam should be minimum of 60 g/l. The foaming agent should not be brought in contact with any oil, fat, chemical that might harm its function.

The nominal dimensions of the CLC Cubes are as follows confirming the IS-456 (2000).

Length – 150 mm
Height - 150 mm
Width – 150 mm

III. EXPERIMENTAL PROGRAM

Based on their proportion, first appropriate amount of water and cement fed into mixer and thoroughly mix such that the even distribution of cement. Now based on their different proportion each, Fly ash is added to the mixer of water and cement. Mixing is continued such (Mortar slurry preparation). Then preparation of pre-foamed by diluted the foam agent with water and extracted by using foam generator and air compressor. Then measured amount of foam is added to the wet slurry and ensure foam has been completely mixed.

When mixing is being completed, check the wet density of cellular light weight concrete at appropriate ratio.

After an additional mixing to get uniform consistency, the wet slurry of cellular concrete is pumped into assembled mould. The dimension of moulds is of standard cubes of size 150×150×150 mm. The best advantage of cellular concrete is to free flowing characteristic enabling it to easily flow into corners. Moulds are leaved till 24 hour (it depends on whether condition of locality) and then demoulded there after cubes are cured for about 21 to 28 days

IV.CLASSIFICATION OF CLC BLOCKS

The cellular light weight concrete confirms the following grades based on different densities:-

GRADE-A: - This grade confirms the load bearingunits and has density ranging from 1200 to 1800 kg/m^3.

GRADE-B: -This grade confirms the non-load bearing units and has density ranging from 800 to 1000 kg/m^3.

GRADE-C: - These are used for providing thermal insulation and have density ranging from 400 to 600 kg/m^3.

Therefore, CLC can be produced in a density range of 400 to 1800 kg/m^3. In CLC, the density is controlled by introduction of gas or foam by foam generator.

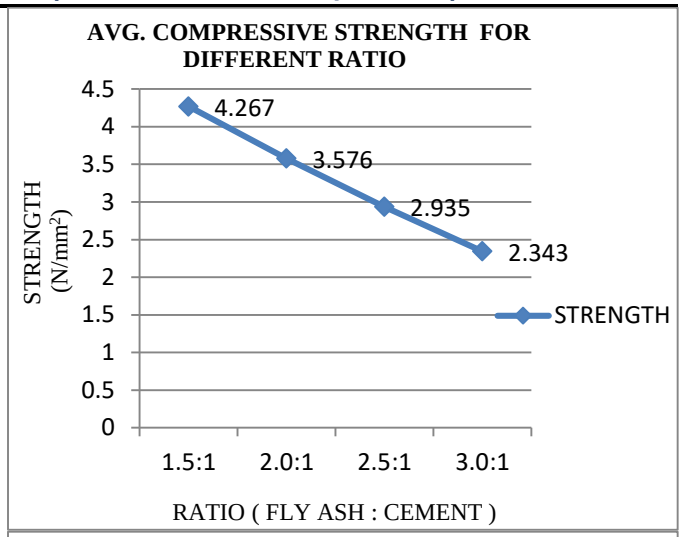
V. COMPARISON OF TECHNICAL PARAMETERS

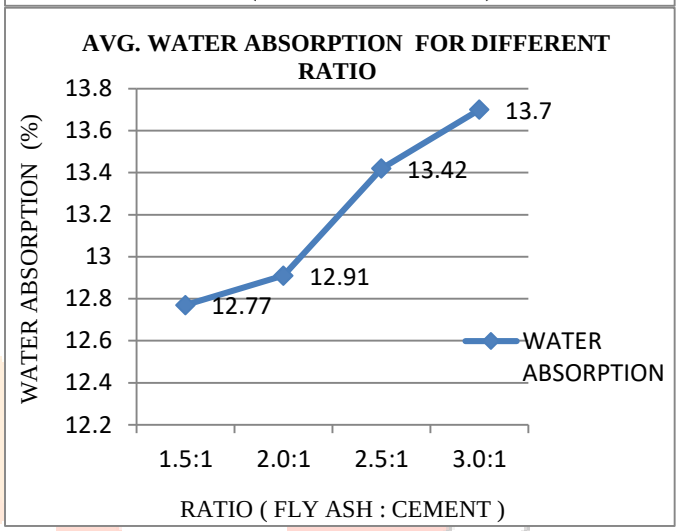
Each ratio with different density contains 5specimens, 3 specimens are tested for characteristic strength (compressive strength) and 2 specimen tested for water absorption. The results of CLC Cubes are tabulated below

TABLE-I

AVG. TEST RESULTS

RATIO	COMPRESSIVE STRENGTH (MPa)	WATER ABSORPTION(%)
1.5:1	4.267	12.77
2:1	3.576	12.91
2.5:1	2.935	13.42
3:1	2.343	13.70





RATIO	FOAM (ml)	DENSITY (kg/m^3)	STRENGTH (MPa)	WATER ABSORPTION (%)
1.5:1	300	1030	5.143	11.80
1.5:1	500	950	4.736	12.56
1.5:1	700	860	2.923	13.96
2:1	300	1020	4.181	12
2:1	500	940	3.885	12.71
2:1	700	850	2.664	14.02
2.5:1	300	1000	3.663	12.34
2.5:1	500	930	3.219	12.96
2.5:1	700	820	1.924	14.97
3:1	300	980	2.923	12.38
3:1	500	900	2.775	13.57
3:1	700	800	1.332	15.16

VI. RESULT

The compressive strength of specimens is as

- For ratio of 1.5:1, minimum strength is 2.923 MPa at density 860 kg/m^3 and maximum strength is 5.143 MPa at 1030 kg/m^{3}density.
- For ratio of 2:1, minimum strength is 2.664 MPa at density 850 kg/m^3 and maximum strength is 4.181 MPa at 1020 kg/m^3 density.
- For ratio of 2.5:1, minimum strength is 1.924 MPa at density 820 kg/m^3 and maximum strength is 3.663 MPa at 1000 kg/m^3 density.
- For ratio of 3:1, minimum strength is 1.332 MPa at 800 kg/m^3 density and maximum strength is 2.923 MPa at 980 kg/m^3 density.

VII. DISCUSSIONS

1. This study considered density between 800 to 1100 kg/m^3.
2. This result shows that by increasing cement content, the strength is increases but it also slightly depends on density i.e. at 1030 kg/m^3.
3. As foam increasing by 300ml, 500ml and 700 ml for individual ratio like 1.5:1, the strength is decreases thus result shows that strength decreases as density decreases, from 1030 kg/m^3 to 860 kg/m^3.
4. Best results of ratio (1.5:1, 2:1, 2.5:1) for density of Between 930 to 1050.
5. Density below 900 does not give a satisfactory result for ratioof 2.5:1 and 3:1.
6. As well as density increasing, water absorption decreases in smaller percentage and strength increases.

VIII. ADVANTAGES

1. Fly-ash based Cellular light weight concrete is considered as environment friendly sustainable material produced with least energy demand.
2. CLC is having main advantages in building construction are of sound absorption, cooling in season (summer), termite resistance, very low water absorption.
3. Fly ash is a one of the industrial waste product that is not easy to dispose in nature. CLC solves the problem of disposal of fly ash in construction industry.
4. Its significant property is to reduced weight at no sacrifice in strength. This enables to reduction of Dead load.

IX. CONCLUSION

The process of manufacturing cellular light weight considering an economical ratio based on fly-ash and cementso this study on cellular light weight concrete will helps to improve their structural property in construction industry. Cleaner production effort is required in India and hence CLC blocks may be used for construction purpose. The best insulating property of foam concrete is due to the great number of closed cavities. CLC blocks are used in construction industry as:-

- Construction of partition wall.
- Partition for heat insulation purposes.
- Construction of hollow filled floors.

ACKNOWLEDGEMENT

The heart full wishes to thank the authorities of M/S Greentech Industries, (UP) for giving the opportunity to conduct the experiments.

REFERENCES

[1] Shivajirao S. “Use of Ultrafine Materials for Cellular Concrete Blocks” International Journal of Science and Research (IJSR) ISSN: 2319-7064

[2] [1]Virendra sahu, [2]Pallavi Dandwate and [3]Bhushan Bakalkar, “Study on Cellular Lightweight Concrete” International Journal of Trend in Research and Development, Volume 5(6), ISSN: 2394-9333

[3] Nagesh.Mustapure1 “A STUDY ON CELLULAR LIGHTWEIGHT CONCRETE BLOCKS” IJRET: International Journal of Research in Engineering and Technology eISSN: 2319- 1163 | pISSN: 2321-7308

[4] G.Deepa1, K. Mythili2, Venkata Ratnam3 “CELLULAR LIGHT WEIGHT CONCRETE BLOCKS WITH DIFFERENT MIXPRO¬PORTIONS” https://www.ijripublishers.com/Articals/Volume-2/Issue-2/IJRI-02-052/CELLULAR LIGHT.

[5] KhampheeJitchaiyaphuma*, TheerawatSinsiria□, PrinyaChindaprasirtb “Cellular Lightweight Concrete Containing Pozzolan Materials” Science Direct Elsevier

[6] Kearsley, E.P. and Wainwright, P.J. (2002). The effect of porosity on the strength of foamed concrete. Cement and Concrete Research, Vol. 32, No. 2, pp. 233-239.

[7] Konecny, L. and Naqvi, S.J. (1993). The effect of different drying techniques on the pore size distribution of blended cement mortars. Cement and Concrete Research, Vol. 23, No. 5, pp. 1223-1228.

[8] Nambiar, E.K. Kunhanandan and Ramamurthy, K. (2006). Influence of filler type on the properties of foam concrete. Cement and Concrete Composites, Vol. 28, No. 5, pp. 475-480.

[9] Narayanan, N. and Ramamurthy, K. (2000). Structure and properties of aerated concrete: a review. Cement and Concrete 17 Composites, Vol. 22, No. 5, pp. 321-329.

[10] Wang, Kuen-Sheng, Chiou, Ing-Jia, Chen, Ching-Ho and Wang, Davin (2005). Lightweight properties and pore structure of Foamed material made from sewage

sludge ash. Construction and Building Materials, Vol. 19, No. 8, pp. 627-633.

[11] P. J. Tikalsky, J. Pospisil, and W. M. Donald, "A method for assessment of the freeze–thaw resistance of preformed foam cellular concrete," Cement and Concrete Research, 2004, vol. 34, no. 5, pp.889-893.
[12] Tarasov, E. P. Kearsley, A. S. Kolomatskiy, and H. F. Mostert,"Heat evolution due to cement hydration in foamed concrete,"Magazine of Concrete Research, 2010, vol. 62, no. 12, pp. 895-906.
[13] M. Jones and A. McCarthy, "Heat of hydration in foamed concrete:Effect of mix constituents and plastic density," Cement and ConcreteResearch, 2006, vol. 36, no. 6, pp. 1032-1041.
[14] H. Tanyildizi and A. Coskun, "Performance of lightweight concrete with silica fume after high temperature,"Construction and BuildingMaterials, 2008, vol. 22, no. 10, pp. 2124-2129.
[15] R. V. Balendran, F. P. Zhou, A. Nadeem, and A. Y. T. Leung,"Influence of steel fibres on strength and ductility of normal andlightweight high strength concrete," Building and Environment, 2002,vol. 37, no. 12, p. 1361-1367.
[16] K. Jitchaiyaphum, T. Sinsiri, and P. Chindaprasirt, "Cellularlightweight concrete containing pozzolan materials," ProcediaEngineering, 2011, vol. 14, pp. 1157-1164.
[17] IS: 3495 (Part 2): 1992 – Method of tests of burnt clay building bricks., Part 2- Determination of Water Absorption
[18] IS: 516-1959 "Methods of Tests for Strength of Concrete", Bureau of Indian Standards, New Delhi
[19] Jones M.R. & McCarthy A. Preliminary views on the potential of foamed concrete as a structural material. Mag. Concr. Res. 57 (1), pp 21-31, 2005.
[20] R.A.Barnes., Innovation and development in concrete materials and design, Proceedings of the International Conference on concrete construction, Kingston University. London, UK, September 2008
[21] Van Deijk S., Foamed Concrete. A Dutch View. Pp 2-8. BRE, 1992.
[22] IS 456 : 2000 – Plain and reinforced Concrete – Code of Practice
[23] M.S. Shetty, Concrete Technology Theory & Practice, Published by S. CHAND & Company, Ram Nagar, New Delhi
[24] Neville. A.M., Properties of Concrete, 4th Edition, Pitman Publishing Limited, London 1997
[25] Xiaoheng Wang (2010), Environmental Pollution from rural brick-making Operations and their health effects on workers.