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Experimental Study on Achievement of Density and Strength in Light Weight Pumice Stone Concrete With Saw Dust Powder

KEYWORDS: Floating concrete, Pumice stone, Aluminum powder, Fly ash, Density, Compressive strength saw dust powder.

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ABSTRACT *Here in this study floating concrete with lightweight aggregates (Pumice stone) and Aluminum powder as an air entraining agent is prepared. There are many types of lightweight concrete which can be produced either by using lightweight aggregate or by using an air entraining agent. Since this is a unique type of concrete hence authors found that very meager quantum of work is carried out in this regard hence authors have taken up this study under consideration, out of motivation. In this study we have worked on combination of above mentioned types. This concrete is a non-structural concrete. In this study, comparison has be made between plain cement concrete and lightweight concrete having different proportion of Aggregate size and fix quantity of Aluminum content (i.e. 2%) by the weight of cement has been taken into account. And also sawdust powder also has been used as partial replacement of fine aggregate. It helps to increase volume of concrete and hence reduce the weight. Different iterations in the form of samples were carried out and results were discussed below. However sample 4 turns out to be optimum for our mix proportion. This type of concrete reduces the cost of the project than the regular masonry structure. The optimum values for the light weight concrete of our sample 4 which is good for light weight concrete are with average density as 1102.66 kg/m3 and average compressive strength as 8.61, hence this satisfies the requirement of floating concrete.*

INTRODUCTION

The present day world is witnessing construction of very challenging and difficult civil engineering structures. Researchers all over the world are attempting to develop low density or lightweight concrete by using different admixtures in concrete up to certain proportions. Floating concrete is made by introducing air or gas into concrete slurry, so that when the mix sets and hardens, uniform cellular structure is formed. Thus it is a mixture of water, cement and finely crushed sand. We mix fine powder of Aluminum to the slurry and it reacts with the calcium hydroxide present in it thus producing hydrogen gas. This hydrogen gas when contained in the slurry mix gives the cellular structure and thus makes the concrete lighter than the conventional concrete. Pumice stone is a lightweight aggregate of low specific gravity. It is a highly porous material with a high water absorption percentage. In this we do not use the conventional aggregate and replace it by the pumice stone. Pumice is the specimen of highly porous rocks having density approximately 500-600 Kg/m3[4]. Although it gives the desired results but we have added sawdust powder approximately about 10% by weight of fine aggregate which gives leads to increase in the durability of concrete. Pumice has an average porosity of 60-80% and initially floats on water[2].

II.MATERIALS USED

Cement – ordinary Portland cement 53 -grade

Sq. No.	Wt. (kg)	Sl no	Density (kg/m3)	Average Density (kg/m3)	Load (KN)	Strength (N/mm2)	Avg. comp strength (N/mm2)
1	7.9	1)	2340.74		315	14.00	
2	8.3	2)	2459.25	2464.194	355	15.778	15.733
3	8.75	3)	2592.59		392	17.422	

Aggregate – Pumice Stones – 10 to 20 mm
Sand – Standard
Partially replaced sand by sawdust about 10%
Other- pumice powder
Admixtures –Aluminium Powder
Water – Tap water
Mixed Procedure – hand mixing
Compaction – Ramming, rodding,tamping
Curing practice - Moist curing by submersion
Cube size – 15cm×15cm×15cm
Testing of cubes – Compressive test after 3,7,21,& 28 days

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III. EXPERIMENTAL PROGRAM
TESTING OF MATERIALS

Sr. no	Description of Test	Results
1	Spesific gravity a)Cement b)Fine aggregate	 3.15 2.61
2	Finess of cement	05%
3	Standard consistency of cement	34%
4	Setting time of cement a)initial setting time b)final setting time	 40 min-utes 262 min-utes
5	Density of pumice stone	641 kg/ m3
6	Density of saw dust powder	210kg/m3

Sq. No.	Wt. (kg)	Density (kg/m3)	Average Density (kg/m3)	Load (KN)	Strength (N/mm2)	Avg. Comp strength (N/mm2)
1	4.76	1410.37		200.2	8.897	
2	5.35	1585.18	1519.99	231.88	10.305	10.132
3	5.28	1564.44		251.93	11.196	

Sample 1: 12 cubes
Cement: 64 kg
Crushed sand: 80kg
Pumice stone (< 20 mm):20kg
Water: 35.2kg
Admixture: aluminum powder 2%
Saw dust powder 10% by weight of fine aggregate: 8kg

RESULTS: AFTER 3 DAYS CURING
Sample 2: 12 cubes
Cement: 32 kg
Pumice powder:10 kgkg

Sp No.	Wt. (kg	Density kg/m3	Average Density kg/m3	Load KN	Strength N/mm2	Avg. Strength N/mm2
1	6.8	2014.814		286	12.711	
2	7.36	2180.74	2176.78	319	14.17	14.53
3	7.88	2334.814		376	16.711	

Crushed sand :48kg
Pumice stone: (< 20 mm): 20kg
Water: 17.6kg
Admixture: aluminium powder 2% Saw dust powder 10% by weight of fine aggregate:4.8 kg

RESULTS: After 7 days of curing
Sample 3: 12 cubes
Cement: 24 kg
Pumice powder: 10kg

Sp. No.	Wt. kg	Density kg/m3	Avg Density kg/m3	Load (KN)	Strength N/mm2	Avg. Strength N/mm2
1	3.84	1137		202	8.97	
2	3.65	1081	1102.66	196	8.71	8.61
3	3.68	1090		184	8.17	

Pumice stone: (10 to 20 mm): 20 kgkg
Crushed sand : 10kg
Water: 13.2 kg
Admixture: Aluminum powder 2%
Saw dust powder 10% by weight of fine aggregate: 4kg

RESULTS: After 21 days of cube testing
Sample 4: 12 cubes
Cement: 16 kg
Pumice powder: 12 kg
Pumice stone: (10 to 20 mm): 24 kg
Crushed sand : 24 kg
Water: 8.8kg
Admixture: Aluminium powder 2% Saw dust powder 10% by weight of fine aggregate : 1.6kg

RESULTS: 28 days cube testing

IV.RESULTS AND DISCUSSION
Sample1 gives average compressive strength 15.733 N/mm2, which is good for lightweight concrete. Also it gives average density 2464.194 kg/m3, but we have to reduce the density of concrete to nearly equals to density of water, so it is to be required that reduce the quantity of crush sand and that's why we reduced the quantity of crushed sand and also replaced it with pumice sand passing through IS sieve of size 4.75 mm. in next sample. Also we used two fractions of Aggregate i.e. M1 (10mm to 20 mm) and M2 (4.75 mm to 10 mm).

Sample 2 gives the improved results having average density 2176.78 kg/m3 and average compressive strength 14.53N/mm2, but average density of concrete is not nearly equals to the density of water. Also the quantity of cement is high, so we discussed this situation with our guide. He told us that if you reduce the quantity of cement it will help us to reduce the density as well as to achieve economy. Therefore in next sample we reduced the cement quantity and increased the pumice sand.

Sample 3 gives lightweight concrete having average compressive strength 10.132N/mm2and average density 1519.99 kg/m3. Which is not less than the density of water hence the concrete cube It was light as desired but its finishing was not good. It happens because of the large sized aggregate. So we have decided to eliminate large size aggregate completely.

Sample 4 gives lightweight concrete having surface flat & smooth and showing a good finish. Its average density is 1102.66 kg/m3 and average compressive strength 8.61 N/mm2. From the above results it seems that the compressive strength is increased even if the density is nearly same as the previous sample. So this sample is perfect for the mix proportion.

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V. CONCLUSION

In our project of floating concrete we investigated that influence of aggregate type and the amount on compressive strength of concrete were investigated. We have used different aggregate proportion with a satisfied strength. The result of our investigation showed that aggregate size and proportion influences the unit weight and also reduces the self weight and consequently bending moment reduces .But this a non structural concrete .hence therein strength of concrete decreases. However for the sample 4 it is Reverse, because this proportion gives compressive strength 8.61N/mm2 which is good for the light weight concrete having density 1102.66 kg/m3. From cost analysis it is proved that the cost of our project is less than that of brick masonry. The study showed that using pumice aggregate as a common mixture enable to produce different strength grade lightweight concrete with different unit weight. These concrete does not satisfies the strength requirements for load bearing structural elements. In this study only strength and unit weight were considered, other properties including carbonation and drying shrinkage, thermal conductivity and sound insulation properties can be investigated as a further study.

REFERENCES

1) Dhawal Desai, "Development of Light Weight Concrete", Civil Engineering Portal, 2014.
2) T. Parhizkar, M. Najimi and A.R. Pourkhorshidi, "(Application of pumice aggregate in structural lightweight concrete", Asian journal of civil engineering (building and housing) VOL. 13, NO. 1 (2012) PAGES 43-54.
3) N. Sivalinga Rao, Y.Radha Ratna Kumari, V. Bhaskar Desai, B.L.P. Swami, "Fibre Reinforced Light Weight Aggregate (Natural Pumice Stone) Concrete", International Journal of Scientific & Engineering Research Volume 4, Issue 5, May-2013
4. F. Falade, (1990). "Effect of Sawdust Ash on the Strength of Laterized Concrete", West Indian Journal, vol. 15, no. 1.