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A Study on the Properties of Aerated concrete using Eps beads and Vermiculite as filler material

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Abstract - — *Aerated light weight concrete has gained tremendous popularity in recent decade. It have many advantages when compared with conventional concrete such as reduced dead weight, lower coefficient of thermal expansion, good sound insulation and use of less mortar joints. The reduction in the dead weight of the construction materials using lightweight concrete, could result in a decrease in cross-section of concrete structural elements like columns, beams, and foundation. The reduction in dead weight may reduce the transmitted load to the foundations. The aim of this study is to produce aerated light weight concrete using EPS beads and vermiculite as filler materials.Different dosages of hydrogenperoxide (0.5%,1%,2%,2.5%,3%,3.5%,4%) by weight of cement concretet will be used to produce aerated light weight concrete . Water cement ratio is fixed by trial and error method and produce light weight aerated concrete*

1. INTRODUCTION

Light weight concrete can be defined as a type of concrete which includes an expanding agent which increases the volume of mixture while reducing the dead weight. It is lighter than conventional concrete with a dry density below 1800kg/m^3 .The main specialties of the light weight concrete are the low density and low thermal conductivity. There are many types of light weight concrete which can be produced either by using light weight aggregate or by using an air entraining agent. In this research, hydrogen peroxide has been used as the air entraining agent. Hydrogen peroxide reacts with the calcium hydroxide in the cementatious system produces hydrogen gas. This hydrogen gas in the mix gives the cellular structure and makes the concrete lighter than the conventional concrete

1.1 Objective of the study

1. To develop light weight aerated concrete.
2. To study the fresh properties of aerated concrete.
3. To study hardened properties of aerated concrete.

1.2 Scope of the study

1 This study is confined to the performance based on 53 grade of Ordinary Portland cement only.

2 This study is confined to a single air entraining agent.

3 Study is restricted to a single type of super plasticizer

2. EXPERIMENTS

2.1 Materials

53 grade ordinary Portland cement was used as a binding material. Properties of cement used are listed in Table 1.Msand,cement,flyash,air entraining agent were used for making reference specimen.Meanwhile,Eps beads and vermiculite were used as filler material for making aerated light weight concrete. Physical properties of msand are listed in Table 2 and the details of air entraining agent were listed in Table 3.

2.2 Mix proportion

The mix proportion used in this study is listed in Table 4.The water-cement ratio and the dosage of super plasticizer and hydrogen peroxide were fixed at 0.34%,0.4% and 2.5% for making aerated lightweight concrete with Eps beads and that of aerated light weight concrete with vermiculites were 0.54%,0.4% and2.5% respectively.

Table -1: Properties of cement

Specific gravity	2.6
Standard consistency	32%
Fineness	7.41%

Table -2: Properties of Msand

Specific gravity	2.69
Water absorption	0.66%
Fineness modulus	4.6

Table -3: Properties of air entraining agent

Base material	PH	Specific gravity	Colour
Hydrogen Peroxide	3.3	1.13	Colourless liquid

Table -4: Mix proportion of aerated light weight concrete with EPS beads

MIX	A_1	A_2	A_3
Cement	200kg/m3	200kg/m3	200kg/m3
sand	600kg/m3	600kg/m3	600kg/m3
Fly ash	350kg/m3	350kg/m3	350kg/m3
EPS Beads	10kg/m3	8kg/m3	7kg/m3
H_2O_2	2.5%	2.5%	2.5%
Super plasticizer	0.4%	0.4%	0.4%
W/C ratio	0.34%	0.34%	0.34%

Table -5: Mix proportion of aerated light weight concrete with vermiculites

MIX	A_1	A_2	A_3
Cement	200kg/m3	200kg/m3	200kg/m3
M sand	600kg/m3	600kg/m3	600kg/m3
Fly ash	350kg/m3	350kg/m3	350kg/m3
Vermiculite	10kg/m3	8kg/m3	7kg/m3
H_2O_2	2.5%	2.5%	2.5%
Super plasticizer	0.4%	0.4%	0.4%
Water cement ratio	0.54%	0.54%	0.54%

3. RESULTS

Table -6: Wet and dry densities of aerated light weight concrete with Eps bead

Amount of EPS beads in kg	Wet density kg/m³	Dry density kg/m³			Compressive strength in N/mm²		
		3day	7day	28day	3day	7day	28day
6	1512	1401	1431	1512	3.8	5.2	7.5
7	1328	1352	1386	1413	2.7	4.13	4.73
8	1276	1134	1267	1286	1.9	2.7	3.89
10	1003	906	1178	1190	0.89	1.88	3.71

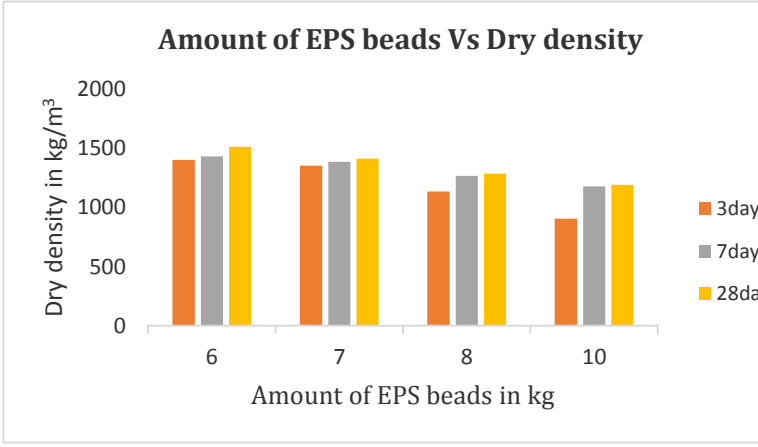

Chart -1:Amount of Eps beads Vs Dry density

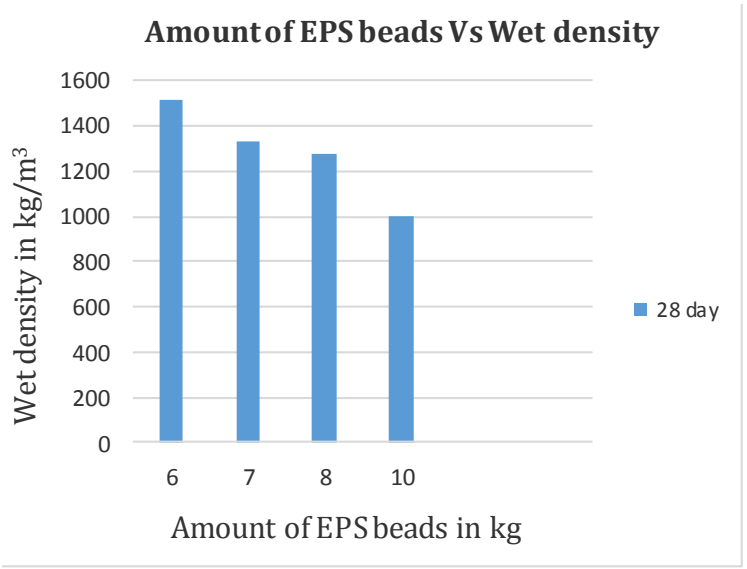

Chart -2:Amount of Eps beads Vs Wet density

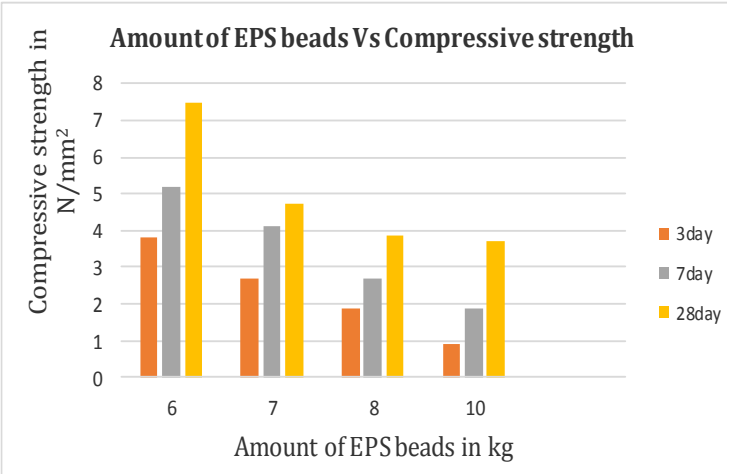

Chart -3:Amount of Eps beads Vs Compressive strength

Amount of Vermiculite in kg	Wet density kg/m³	Dry density kg/m³			Compressive strength in N/mm²		
		3day	7day	28day	3day	7day	28day
6	1702	1656	1756	1785	14.69	15.98	16.21
7	1664	1610	1684	1701	13.78	14.18	15.84
8	1549	1440	1561	1587	12.08	13.08	14.31
10	1400	1315	1396	1452	11.93	12.01	14.12

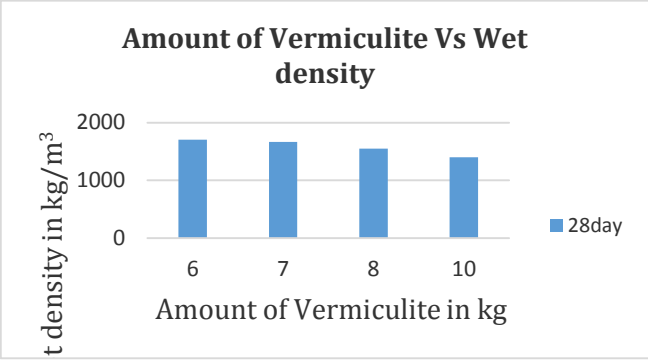

Chart -4:Amount of Vermiculite Vs Wet density

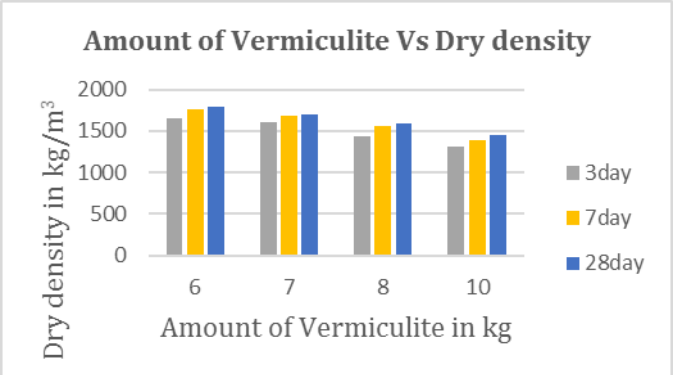

Chart -5: Amount of Vermiculite Vs Dry density

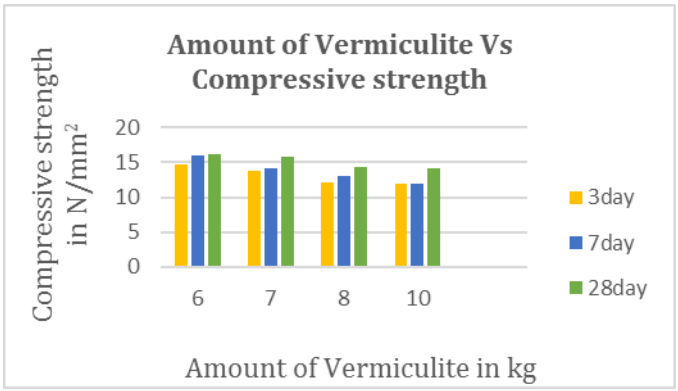

Chart -6: Amount of Vermiculite Vs Compressive strength

3. CONCLUSIONS

The addition of hydrogen peroxide make the concrete aerated. The result show that the flow and wet density of concrete is lowered with the increasing amount of hydrogen peroxide from 0.5% to 2.5%. Further increasing the amount of hydrogen peroxide, increases the density of concrete. Optimum amount of hydrogen peroxide which make the aerated concrete lighter is about 2.5% and higher amount of EPS beads provides lower compressive strength and self-weight for lightweight concretes. On decreasing the amount of Eps beads, its compressive strength and self-weight get increased. Aerated concrete with EPS beads provide less self-weight than that of Vermiculite

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