Light Weight Bricks Obtained by Mixing Portland Pozzolana Cement, Sand and Bagasse Ash with Adhesive

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Abstract— Bricks are mostly used construction material around the world. Generally bricks are produced from clay at high temperature. But in many are of world, mostly in developing country there is shortage of natural source material for production of the conventional bricks. For environmental protection and sustainable development, various researches have been conducted on production of bricks from waste material. This paper present utilization of waste materials. In this paper use of bagasse ash with cement, sand and bagasse ash with gumarabic is used as an adhesive. Five different mixers where prepared M1, M2, M3, M4, and M5.the composition of the mixer are shown in table 1.4.The size of bricks are 225×110×70 mm non modular size.

Key words: Cement, Sand, Bagasse Ash, Bricks, Lightweight, Gum Arabic, SNF

I. INTRODUCTION

Bricks are the most commonly used construction material all over the world for a long time. It is basically composed of clay soil. But due to environmental aspect, recently government and other agency are focusing on ash bricks. So we look for alternative material, with that in mind a research was conducted by using Portland Pozolona cement, sand and bagasse ash with some adhesive. Recently sugarcane bagasse ash, which is a by product of sugar factories found after burning sugarcane bagasse which in turn is found after the extraction of all economical sugar from sugarcane, has been tested in some parts of the world for its pozzolanic property and has been found to improve some of the properties of like compressive strength and water absorption in certain replacement percentages..

II. MATERIAL USED

A. Portland Pozzolana cement

Portland pozzolana cement (PPC) is manufactured by the intergrinding of OPC clinker with 15 to 35 % of pozzolanic materials. Pozzolanic materials are siliceous or aluminous materials which by themselves posses little or no cementitious properties.

S. No.	Name of test	Test result
1.	Fineness	8%
2.	Consistency	30.5%
3.	Initial setting Time	90 mint
4.	Final setting Time	315
5.	Specific Gravity	2.98

Table 1: Physical properties of cement (P.P.C)

B. Bagasse Ash

The use of different cement replacing materials has become a common practice in the construction industry. Most of these cement replacement materials are by products of different industries and agricultural wastes. Sugarcane bagasse ash has also been found to have such pozzolanic property. Bagasse is a cellulose fibre remaining after the extraction of the sugar-bearing juice from sugarcane. Bagasse ash is one of the biomass sources and valuable by products in sugar milling that often uses bagasse as a primary fuel source to supply all the needs of energy to move the plants.. The bagasse ash material is collected from Birla sugar mill near kushinagar district in Uttar Pradesh.

C. Gum Arabic

The physical properties of gum Arabic, established as quality parameters include moisture, total ash, volatile matter and internal energy. Gum Arabic is a natural product complex mixture of hydrophilic carbohydrate and hydrophobic protein components emulsifier which adsorbs onto surface of oil droplets while hydrophilic carbohydrate component inhibits flocculation and coalescence of molecules through electrostatic and steric repulsions in food additives

S.No.	Property	Range
1	Moisture content (%)	13-15
2	Ash content (%)	2-4
3	Internal energy (%)	30-39
4	Volatile matter(%)	51-65
5	Nitrogen content (%)	0.26-0.39

Table 2: Physical property of gum arabic

D. Super Plasticizer:

As per concerning IS 15658: 2006 admixture shall confirming to IS 9103 and added for Specific requirement without affecting the other quality parameter. The super plasticizer used was in the liquid state.

Thus the super plasticizer produces a homogeneous, cohesive concrete generally without any tendency of segregation and bleeding.

S.No.	Property	Range
1	Appearance	Dark tan colored liquid
2	Specific gravity	1.235
3	PH	8.5 (+0.5,-0.5)
4	Sodium sulphonate content	4% maximum
5	Viscosity at 30 C	20
6	Solid	43%

Table 3: Specification of SNF in liquid form

III. EXPERIMENTAL PROGRAM

A. Mix proportion for Casting of P.P.C Bricks

For casting of bricks five different mix proportion are also taken. In this proportion the quantity of SBA will be increases in mixer. The quantity of water should be added

different-different for all the proportion. The quantity of water should be added as per OMC test conducted on the entire sample, after mixing the sample machine press is done.

Mixer	Adhesive	Super plasticizer
M1=15% (S.B.A) + 65% (SAND) +20% (CEMENT)	2% by weight of Cement	2% by weight of Cement
M2=20% (S.B.A) + 60% (SAND) +20%(CEMENT)	2% by weight of Cement	2% by weight of Cement
M3=25% (S.B.A) +55% (SAND) +20% (CEMENT)	2% by weight of Cement	2% by weight of Cement
M4=30%(S.B.A) +50%(SAND) + 20% (CEMENT)	2% by weight of Cement	2% by weight of Cement
M5=35% (S.B.A) +45% (SAND) +20% (CEMENT)	2% by weight of Cement	2% by weight of Cement

Table 4: Mixer of bagasse ash, sand and cement

IV. RESULT AND CONCLUSION:

S. No.	Mix proportion (SBA+SAND+CEMENT)	% of water absorption at 7 days	% of water absorption at 28 days
1	15% + 65% + 20%	9.59	9.24
2	20 % + 60% + 20%	11.5	11.30
3	25% + 55% + 20%	15.45	14.58
4	30 %+ 50 %+ 20 %	19.43	16.19
5	35% + 45% + 20 %	21.62	18.68

Table 5: Result of Water Absorption Percentage on P.P.C Bricks at 7 days and 28 days

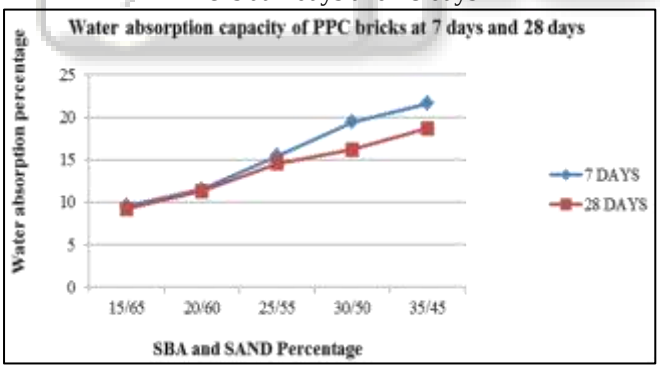

Fig. 1: Water absorption capacity of PPC brick at 7 days and 28 days

S. No.	Mix proportion	Avg. compressive strength of Bricks at 7 days	Avg. compressive strength of Bricks at 28 days
1	15 % + 65% + 20%	10.743	17.188
2	20 % + 60% + 20%	8.677	14.338
3	25% + 55% + 20%	7.355	9.4609
4	30 %+ 50 %+ 20 %	6.197	7.9748
5	35% + 45% + 20 %	3.76	4.8752

Table 6: Result of Compressive strength test on P.P.C Bricks at 7 days and 28 days

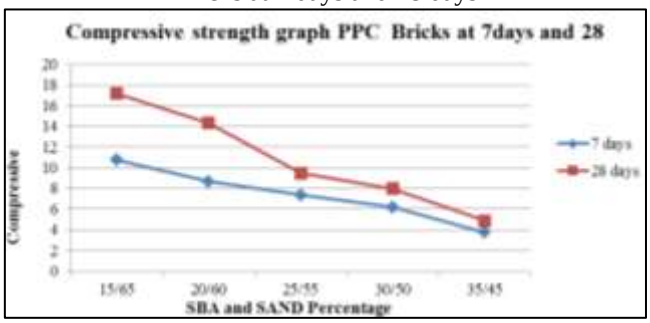

Fig 2: Compressive strength of PPC brick at 7 days and 28 days

Fig. 3: Removing of water during water absorption test

From the results of this experimental study, the following conclusions can be drawn.

1) The sample of PPC bricks satisfies the requirement of compressive strength of class3.5 and class5 of burnt clay bricks of I.S 1077(BIS-1992d).
2) The water absorption capacity of PPC bricks at 7 days is higher than 28 days, because it can be seen that increases in the period of curing resulted in reduction in water absorption capacity, because this is due to the pore structure in younger mortar is coarser and with increases hydration it becomes more refined.
3) As the bagasse ash content increased extra water required for the pozzolanic reaction and hydration of cement.
4) Higher replacements of cement by bagasse ash resulted in higher normal consistency (implying higher water demand for certain workability) and longer setting time.
5) The strength of bricks reduces if content of bagasse ash is increases in the proportion, and it require more water for sample mixing.
6) Using SCBA as replacement of in mortar, the emission of greenhouse gases can be reduced up to

a greater extent. Since bagasse ash is a by-product material, its use as a cement replacing material reduces the levels of CO2 emission by the cement industry.

7) The water absorption capacity of P.P.C bricks, after 28 days satisfy the requirement of I.S-3495 (Part-2) 1976.
8) The Bagasse ash bricks gives better appearance and finishing compare to clay bricks, due to which reduce the chances of plaster on masonary wall.
9) When percentage of bagasse is increases in the composition, the water absorption capacity is also increases but it is less than 20% after curing of 28 days. It satisfy the requirement of I.S codeI.S-3495 (1996).
10) Since at the same time when water absorption capacity is increases the compressive strength of the bricks will be reduces.

Finally the results of this research work have revealed that bagasse ash advantageous to be used in bricks construction industry.

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