COST REDUCTION OF STRENGTHEN BRICKS BY USING CONSTRUCTION WASTE MATERIALS

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ABSTRACT

The present building constructions a lot of demand for the building materials and these building materials are made out of natural and non renewable resources in that one of the very essential materials is brick. Its very demand in present scenario and cost of brick is day by day increased and strength of brick is reduced by manufacture of using various waste materials however the researchers have been investigation construction waste materials but the effect on strength and cost of the brick. The present research on better strength and costless manufacturing of bricks on various experiments conducted using construction Waste materials, there is a lot of pollution being generated due to various waste materials emitting from many sources like industries, apartments, commercial constructions etc.,

The waste material generated from the manufacturing industry, construction industry, apartments and other industrial waste which is harmful to the environment is being recycled and reused for the preparation of the brick with various proportions and specifications. These results in the reduction of cost of brick increase the strength and reduce air pollution and the depletion of natural and non- renewable resources and attaining sustainable development in the aspect of the environment and also the structural and functional aspects of the building.

Keywords: construction waste materials, fly ash, cement

INTRODUCTION

In India, since there is a lot of developmental projects being taking place every day, construction industry have a major role in the economic development of the country. So the demand for the building materials is also being increasing according to the type of project handled. One of such building material is the brick. Brick is a building material used to construct walls, pavements and other masonry structures. It is defined as the blocks of tampered clay moulded to suitable shapes and sizes and dried in the sun light and burnt in kiln to make them hard, strong and durable. Environmental energy also plays a crucial role in the developing countries like India. An increased conscious on the environmental issues has pressured the industries in developing the products mostly environmental friendly. This progressed the production of sustainable materials. Also there is a lot of waste material being generated from the industries, apartments etc., and this waste is being disposed into the land as landfills resulting the land pollution ,into the water bodies resulting the water pollution and some creating the air pollution. These waste materials are studied to be recycled and used in the place of soil and other natural resources.

Various materials have been studied for the preparation of the bricks like PET bottles, fly ash, coconut shells, rice husk ash, coconut fiber, sugarcane bagasse ash, lime, cement, RCL, gold star ash, blast furnace slag, construction waste. For the large production of bricks, the tests are to be conducted not only according to the structural, functional and environmental aspects but also the survey to be conducted for the analyzing for the acceptance of the public and also the government. Our study is about the reduction of the depletion of natural resources and reduces the environmental pollution. The dimensions of the brick are 19cm x 9cm x 9cm and the brick is produced by taking the materials in required proportions followed by batching, mixing and drying. Later, various tests such as compressive test, water absorption, soundness and hardness are conducted on the brick to assess the specifications.

OBJECTIVES

- To reduce the depletion of the natural resource materials.
- To decrease the level of pollution generated by the waste materials emitted from various sources.
- To reduce the cost of the brick.
- To reduce the weight of the brick.
- It is helpful in the construction of load bearing walls.
- To reuse the plastic and other wastes obtained.
- To reduce the waste generated from the construction works.
- To attain the sustainable development.

LITERATURE STUDY

1. **Venkatesh et al. (2017),** has discussed for the replacement of cement with the fly ash and quarry dust in manufacturing of bricks.The proportions of

materials are taken as cement (50%,60%,70%), flyash (40%,30%,20%) and 10% of quarry dust.Based on the results of the tests it is concluded that the cement can be replaced with the quarry dust for about 25% without much loss in the compressive strength and other properties.

2. **AratiShetkar et al. (2016)**, have studied about the use of fly ash for the replacement of clay resulting in better functional, structural and economical properties of the brick which can be made without using cement.The materials used are the flyash(60-80%),gypsum(10%),lime (10-20%) are mixed up in a pan and sufficient percentage of water content is added.Based on the tests it is resulted that these brick are more safe,economical and provides better than the traditional bricks.These can be used for the construction of masonry structures.
3. **Rinku Kumar and Naveen Hooda(2016),** have performed many tests on the bricks made with fly ash and clay and compared both the brick properties which resulted that fly ash bricks can sustain under heavy loads when compared to that of clay bricks.Different tests are conducted like the compressive strength, water absorption, hardness,soundess,efflorescence.Based on the tests it is resulted that fly ash bricks are more strong,durable and economical compared to the traditional bricks.
4. **PuttarajMallikarjunHiremath ,Shanmukhashetty**had studied the utilization of waste plastic in the manufacture of plastic soil bricks.He has studied that the utilization of plastic has obtained the safe disposal and also the use of quarry waste has reduced the problem in its disposal.Because plastic has the nature of insolubility for a period of 300 years in the nature, it is defined as a sustainable waste and environmental pollutant.It has been also given that the utilization of plastic in the building material reduces the environmental impacts caused by it and also reduce the use of conventional building materials.

MATERIALS USED:

A) Construction waste

It is the waste generated from construction works like excavation, land clearance; renovation and road works. There are two types of construction wastes:

- Inert construction wastes which is also known as public fill consists of debris, earth, bitumen and concrete.
- Non inert construction waste which comprises of bamboo, vegetation, timber and other organic materials.

Fig. 1: construction waste

Using of construction waste reduces waste generation and maximize reusing and recycling and also reduce the intake of mixed construction waste at landfills. Construction waste consists of unwanted material produced directly or incidentally by the construction or industries. This includes building materials such as insulation, nails, electrical wiring, shingle, and roofing as well as waste originating from site preparation such as dredging materials, tree stumps, and rubble. Construction waste may contain lead, asbestos, or other substances. Much building waste is made up of materials such as bricks, concrete and wood damaged or unused for various reasons during construction. Observational research has shown that this can be as high as 10 to 15% of the materials that go into a building, a much higher percentage than the 2.5-5% usually assumed by quantity surveyors and the construction industry. Since considerable variability exists between construction sites, there is much opportunity for reducing this waste. In the metropolitan cities, There is a lack of space to dispose the construction waste. Moreover, improper disposal of construction waste and hazardous waste, Is penalized in some countries.

ADVANTAGES

- Reduces penetration and ductility.
- There is no need of curing and heating.
- Reusing the construction waste.

Table 1: physical properties of construction waste

BULK DENSTY	**1564 kg/m3**
POROSITY	**11.22%**
SPECIFIC GRAVITY	**2.40**
WATER ABSORPTION	**28.74%**
SILT CONTENT	**5.22%**

B) FLY ASH

It is the coal combustion product which is composed of the particulates that are driven out of coal fired boilers together with the flue gases. It is a fine grey coloured powder having spherical glassy particles that rise with

the flue gases. The specific gravity of fly ash ranges from a low value of 1.90 for a sub-bituminous ash to a high value of 2.96. As the flash is a very fine material, the particle size ranges in between 10 to 100 micron. The shape of the fly ash is usually spherical glassy shaped. Type C fly ash is produced from the combustion of lignite or sub bituminous coals, contains CaO higher than 10 percent and possesses cementitious properties in addition to pozzolanic properties.

In the past, fly ash was generally released into the atmosphere, but air pollution control standards now require that it be captured prior to release by fitting pollution control equipment. In the United States, fly ash is generally stored at coal power plants or placed in landfills. About 43% of the material is recycled, often used as a pozzolana to produce hydraulic cement or hydraulic plaster and a replacement or partial replacement for Portland cement in concrete production. Pozzolana ensure the setting of concrete and plaster and provide concrete with more protection from wet conditions and chemical attack. Now a days, Flyash is widely used as replacement of cement in the concrete.

Fig. 2 fly ash

ADVANTAGES

- Due to high strength practically no breakage will occur.
- Low water penetration seepage.
- Reduces segregation and bleeding.
- Reduces permeability.

Table 2 : physical properties of fly ash

SPECIFIC GRAVITY	1.97
DIAMETER	0.085
COEFFICIENT OF UNIFORMITY	2.2
CORFFICIENT OF CURVATURE	1.2

Table 3: chemical properties of fly ash

SiO2	60.5%
Al2O3	30.8%
Fe2O3	3.6%
CaO	1.4%
MgO	0.91%

PROCEDURE:

- Initially,The construction waste (35%),Flyash (35%),Cement(15%),Steel slag(15%) are taken.
- A mix is prepared which is to be placed in the mould.
- The brick is demoulded after 24 hours.
- Which is then dried in the oven for 1 hour at 100ºC.
- Later, it sun dried for 4 days to obtain strength.
- After,obtaining sufficient strength tests are conducted in the labouratory.

Table 4: mix proportions of brick

MATERIALS	PERCENTAGE
Construction waste	35
Flyash	35
Cement	30

METHODOLGY

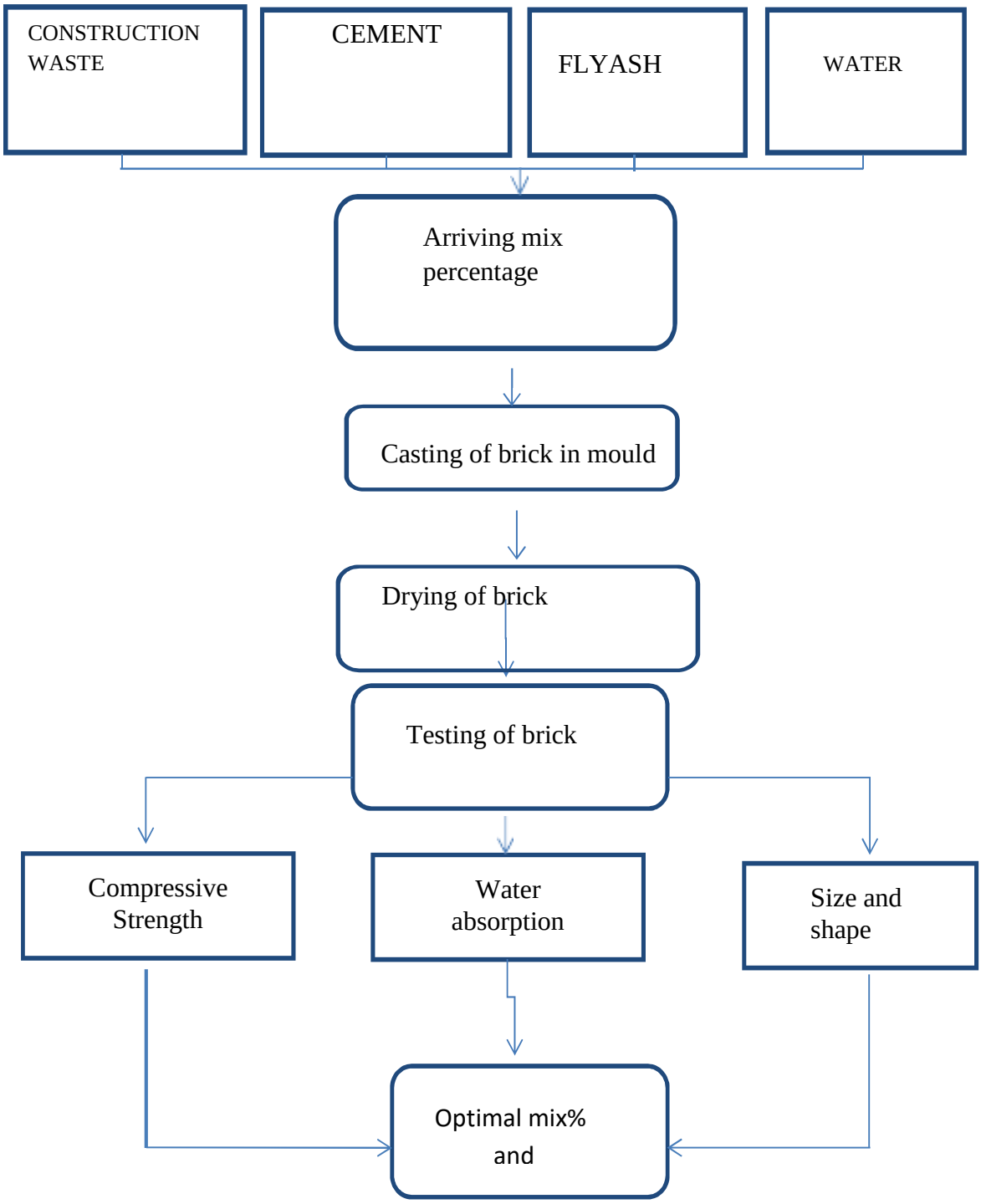

Figure 3: methodology of manufacturing of construction waste brick

GRAPHICAL ABSTARCT

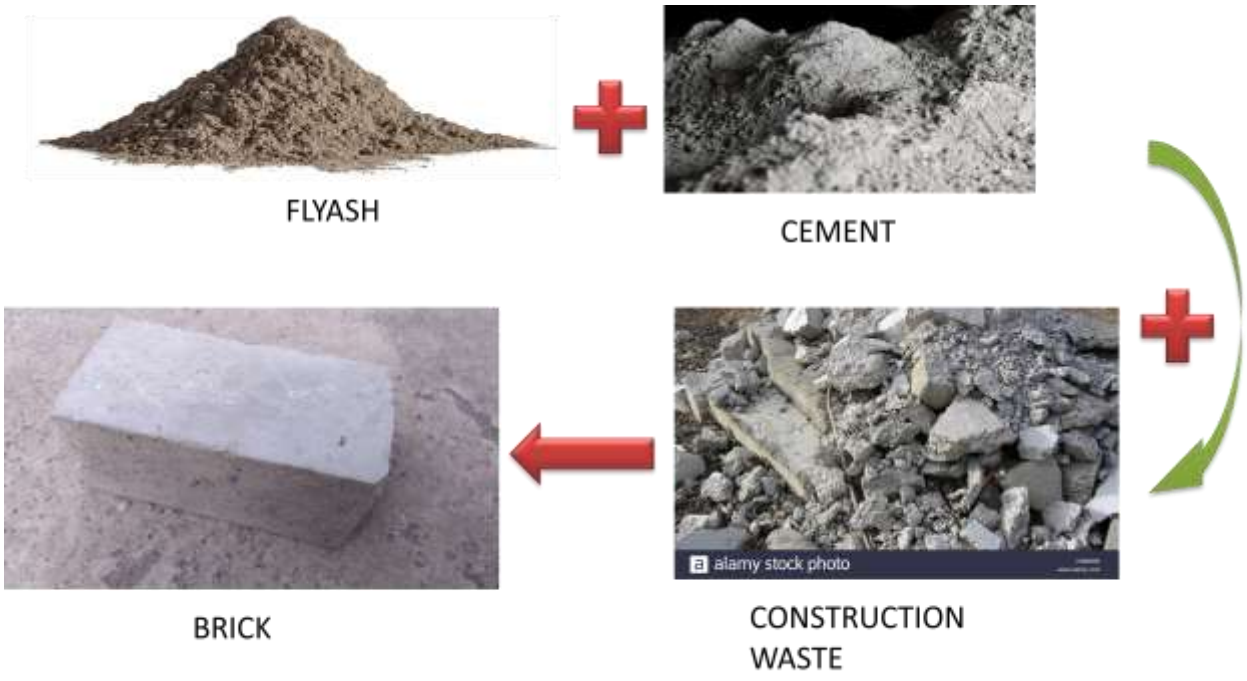

Fig. 4 Graphical representation of process of brick

RESULTS AND DISCUSSION

The brick which is manufactured by using construction waste, fly ash, and cement has possessed the compressive strength of 101.5 Kg/cm2. The brick which is manufactured by using fly ash, construction waste, cement has attained less water absorption value when compared to the standard brick.

Fig. 5 construction waste brick

Table 5: comparision results of construction waste brick

TESTS CONDUCTED	STANDARD BRICK VALUES	EXPERIMENTAL BRICK VALUES
COMPRESSIVE STRENGTH	105 Kg/cm2	101.5 Kg/cm2
HARDNESS	PASSED	PASSED
SOUNDNESS	PASSED	PASSED
WATER ABSORPTION	<12	11.7

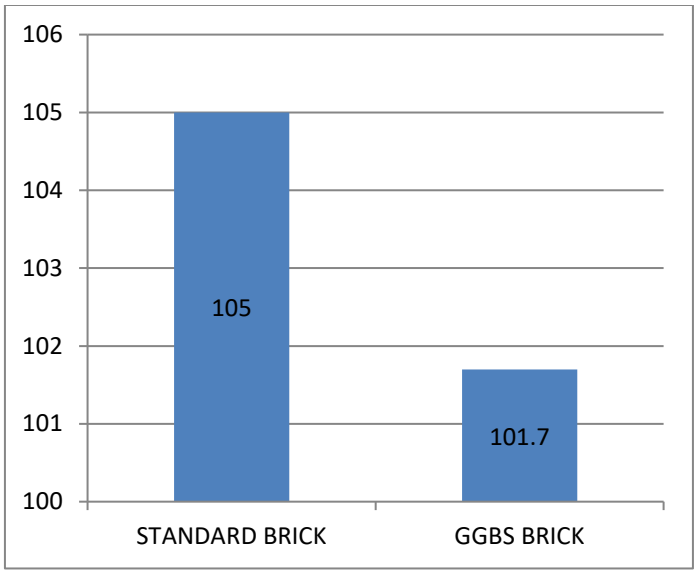

Fig. 6: Compressive strength graph

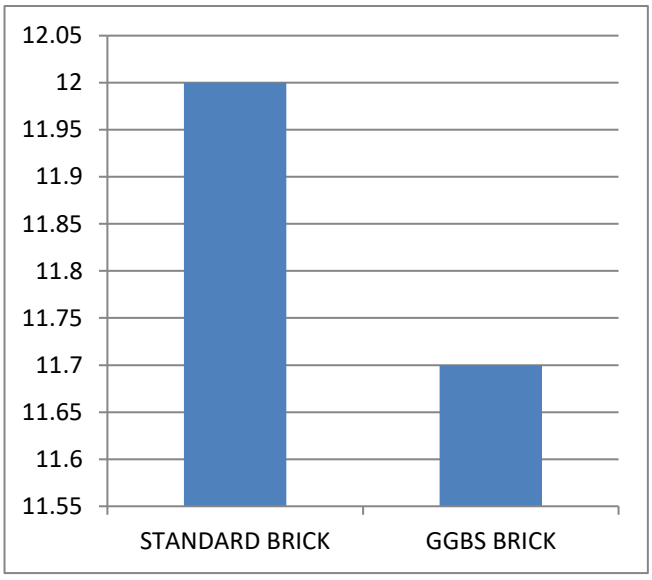

Fig.7 Water absorption graph

CONCLUSION

- The brick which is processed with the materials like construction waste, fly ash, cement had succeeded with a compressive strength of 101.75 Kg/cm2.
- As the construction waste constitutes of the desolate materials like the concrete waste and the brick waste which we have taken.
- The materials already possess the certain strength and other properties. This results in the attaining of good strength for the brick which is prepared.
- Here the combination of the materials has given good strength properties and the workability is also high.
- Its reduce the cost of the brick
- Its prevent the environment pollution
- Construct waste reuse so its natural materials not disturb
- Its good bonding of walls

APPENDIX

Cost of Construction waste brick

BRICK WITH	MATERIALS USED	PERCENTAGE OF MATERIALS	COST OF MATERIALS
CONSTRUCTION WASTE,FLYASH AND CEMENT	FLY ASH	900gms	1Rs
	CONSTRUCTION WASTE	900gms	0Rs
	CEMENT	350gms	2Rs

- Total weight of the brick is 2.5kg and the cost of the brick is 4Rs.
- The compressive strength of this brick is higher than the other bricks.

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