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MANUFACTURING OF LOW COST BRICKS USING PROSOPIS JULIFLORA ASH AND PLASTIC WASTE

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Abstract – *Clay Bricks are a commonly used building material all over the world for constructing walls, pavement and other elements in masonry construction. Conventional bricks are manufactured by burning of clay at high temperature kilns. Extensive research is going on production of bricks from plastic wastes as there is a shortage of natural resources that are used as raw materials for the manufacturing of bricks. This paper presents an experimental study carried out on bricks made from Prosopis Juliflora Ash, plastic waste and Manufactured Sand (M-sand). This investigation also aims to use waste materials effectively since fly ash is a waste obtained from thermal power plants and lime is a waste from water treatment plant.*10%,20%,30% *Prosopis Juliflora Ash, Plastic Waste and Manufactured Sand (M-sand) have been added for testing and validation of new form of brick.*

Key Words: Prosopis Juliflora Ash, Plastic Waste and *Manufactured Sand (M-sand)*

1.INTRODUCTION

Civil engineering construction deals with designing, constructing and maintaining the physical and naturally built environment and to give a sustainable development. On olden days of civil fields all the constructions are to be made with help of bricks only. On today world can be partial changed to RC structure. But, also brick can be used for many works. On olden days of civil fields all the constructions are to be made with help of bricks only. On today world can be partial changed to RC framed structures. But, also brick can be used for partition works. To maintain the quality of work in the construction process, the bricks are investigated by conducting various tests like Compressive strength test, water absorption test. of every stages should be analyzed and evaluated before the process starts.

1.1 Wall

A Wall is a structure that define an area carries a load or provide shelter or security. On olden days in India, walls used to support roofs or ceilings, this type of construction is load bearing construction. In this type of construction total load can be carried on wall. But, now moreover the framed structures are used. That can be constructed by columns, beams and roof is called Framed structure. In this type wall can be used only for the purpose of security and sound. The wall can be constructed by Brick, Wall panel. Moreover, brick only used on large field of construction.

1.2 Brick

A brick is building units used to build walls, footings pavements and other elements in masonry structures. The term brick referred to a unit composed of clay, but it is now used to denote any rectangular units laid with mortar to form a homogeneous structure. A brick can be composed of clay-bearing soil, sand and lime or brick materials. Bricks are produced with different classes, types, materials and sizes which vary with climatic conditions of sites, time duration and are produced in bulk quantities. On the olden days of brick is fired brick. Bricks are laid in courses and numerous patterns known as bonds, collectively known as bonds in bricks and may be laid in various kinds of mortar to hold the bricks together to make a durable structure.

2. MATERIAL USED

In this paper, the chosen material are Prosopis Juliflora ash, Plastic material as chosen because of easy availability on all place and reduce on the cost of manufacturing brick.

2.1Prosopis Juliflora plant

The prosopis juliflora plant grows to a height of up to 12 metres (39 ft) and has a trunk with a diameter of up to 1.2 metres (3.9 ft). Its leaves are deciduous, bi-pinnate, light green, compounded with 12 to 20 leaflets. Flowers appear shortly after leaf development. The flowers are in 5–10 cm long green-yellow cylindrical spikes, which occur in clusters of 2 to 5 at the ends of branches. Pods are 20 to 30 cm long and contain between 10 and 30 seeds per pod. A mature plant can produce hundreds of thousands of seeds. Seeds remain viable for up to 10 years. The tree reproduces by way of seeds, not vegetatively.

Fig - 1. Collection of Prosopis Juliflora plant

Fig - 2. Drying of Prosopis Juliflora plant

Fig - 3. Ashes Of Prosopis Juliflora plant

2.2Plastic Waste

Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat, or humans. The prominence of plastic pollution is correlated with plastics being inexpensive and durable, which lends to high levels of plastics used by humans. However, it is slow to degrade. Plastic pollution can unfavorably affect lands, waterways and oceans. Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of plastic waste, or through exposure to chemicals within plastics that cause interruptions in biological functions. Disposable plastics used in packaging foodstuff meant for human consumption contain harmful compounds. Improper disposal of these packaging products leads to these harmful compounds finding their way to water bodies, where they degradable over a long time due to their non-biodegradable nature.

Table -1: Properties of Plastic

S.NO	PROPERTY	PET OR NYLON
1	Hardness (HRC)	118-120
2	Tensile Strength (MPa)	85
3	Flexural Yield Strength (MPa)	145-310
4	Elongation at Break (%)	5-640
5	Melting Point (celsius)	260
6	Thermal Conductivity (w/m-k)	0.53
7	Tensile Modulus (MPa)	5500

2.3 Manufactured – Sand

Manufactured sand is made of crushed fine aggregate produced from suitable source materials. The M sand production is from the parent mass of rock. According to the parent rock that the chemical composition, mineral properties, texture, composition of M sand would change. Brick has been a leading construction material for over a century: its global production is about 3.8 billion cum roughly 1.5 tones per capita – according to Portland Cement Association data (Portland Cement Association). The high cost of brick depends on the cost of the constituent materials. The cost of brick can be reduced through the use of locally available alternative material, to the conventional ones. At present we are facing an important consumption and a growing need for aggregates because of the growth in industrial production, this situation has led to a fast decrease of available resources. Therefore, it has become necessary to use the Manufactured Sand particularly in the manufacture of brick products for construction purposes. The main goal of this study is to demonstrate the possibility of using Manufactured Sand as a substitute rather than natural aggregates in brick production.

Table - 2: Properties of Manufactured-Sand & Natural Sand

CONSTITUENT	MANUFACTURED – SAND	NATURAL SAND
SiO_2	62.48	80.78
Al_2O_3	18.72	10.52
Fe_2O_3	6.54	1.75
CaO	4.83	3.21
MgO	2.56	0.77

K_2O	3.18	1.23
TiO_2	1.21	Nil
Loss of Ignition	0.48	0.37

2.4 Fine Aggregate

The fine aggregate was screened to remove deleterious materials and tested as per procedure given in IS 2386-1963

Table -3: Test results of fine aggregate

S. No.	Properties	Values
1	Specific gravity	2.62
2	Water content	1.2 %

2.5. Cement

Cement of grade 53 can be used for bending of material. Portland pozzolana cement conforming to IS: 269-1976 and IS: 7031-1968 was used in this study. The cement is of 53grade and the tests conducted on cement are tabulated.

Table – 4: Properties of cement

S.No.	PROPERTY	VALUE
1.	Normal Consistency	29%
2.	Specific Gravity	3.13
3.	Initial setting time	30 minutes
4.	Final setting time	600 minutes
5.	Compressive strength at 3 days 7days 28 days	27.40 N/mm² 29.23 N/mm² 41.62 N/mm²

2.6 Water

The water used for concrete making and curing was tap water available in the laboratory and free from all types of harmful chemicals, organic material, oil, chloride, silt and suspended materials confirming IS 456-2000.

3. CASTING OF SPECIMEN

Mix design is done to achieve the target mean strength and using of materials with required proportion as per the Indian standard codel provisions .the compressive strength of the concrete was determined by cubes. Split tensile strength of the concrete was determined by cylinder.

3.1 Mixing of Brick

Thorough mixing of the material is necessary for the production of uniform course. The mixing should ensure that the mass becomes homogeneous, uniform in colour and consistency. As the mixing cannot be thorough, In present study M15 gradebrick was designed. The weight ratio of mix proportion is 1:2:4 keeping water cement ratio 0.4. It was proposed to investigate the properties of brick. In this experimental work, physical properties of materials used in theexperimental work were determined. M15 grade of reference brick was mixed and cured in potable water.

3.2 Casting of specimen

Wooden mould made of Tee wood dimension 230mm x 80mmx 110mm used for casting of brick. The mould and its base rigidly damped together so as to reduce leakages during casting. The sides of the farm and base plates were oiled before casting to prevent bonding between the farm and brick. The brick was then stored for 5minutes undisturbed at temperature of l8°C to 22°C and a relative humidity of not less than 90%.

4. RESULTS AND DISCUSSION

4.1 Compressive Strength

Compression strength is the total load observed by the brick. The strength of brick is usually defined and determined by the crushing strength of 230mm x 80mmx 110mm, at an age of 14days. It is most common test conducted on hardened brick as it is an easy test to perform and also most of the desirable characteristic properties of brick are qualitatively related to its compressive strength.

Compression strength = load/area

Fig -4: Compressive Strength Test on Brick

Table -5: Compressive strength of brick

S.No	Mix	Avg. Comp. Strength @7 days (N/mm²)	Avg. Comp. Strength @14 days (N/mm²)	Avg. Comp. Strength @28 days (N/mm²)
1	Normal Brick	20.46	25.89	32.74
2	Mix (10%)	21.63	27.45	33.65
3	Mix (20%)	22.65	30.25	36.54

4	Mix (30%)	22.96	31.26	34.87

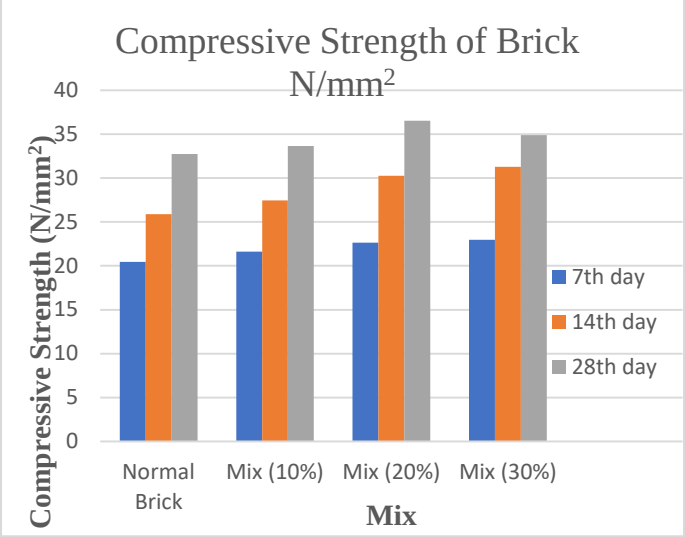

Chart -1: Compressive Strength of Brick N/mm²

4.2 Water Absorption Test

The water absorption test can be used to denote the absorption value of the hybrid material. The average dry weight of brick specimens after removing from farm after 14 days can be measured. Then the average weight of brick specimens after submerging in water for 1 days of age. The percentage of water absorption was measured for each brick specimen and it gave indirect measure of durability.

Percentage of Water absorption =
((Wet Weight – Dry Weight) / Dry Weight) x 100%

Fig -5: Water Absorption Test on Brick

Table -6: Water Absorption of brick

S.No	Brick	Dry Weight (Kg)	Water Absorbed (gm)	Percentage Water Absorbed (%)
1.	Normal Brick	3.950	450	10
2.	Mix (10%)	3.900	350	8.9
3.	Mix (20%)	3.800	325	8.5
4.	Mix (30%)	3.600	300	7.6

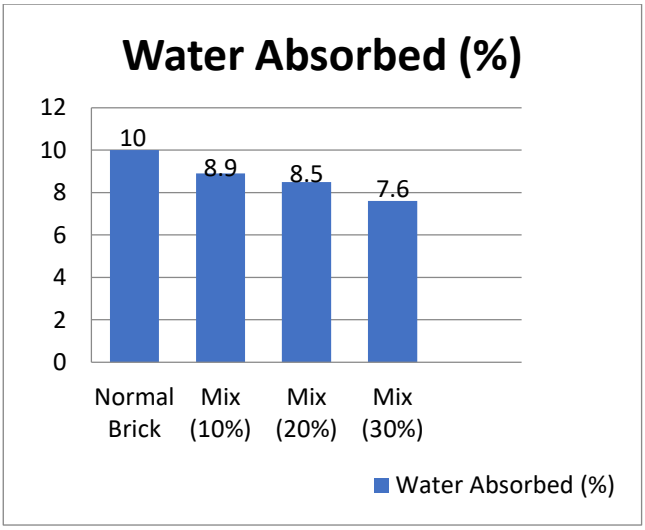

Chart -2: Water absorbed in Percentage

5. CONCLUSIONS

- Various testing have been verified and concluded that Prosopis Juliflora Ash brick cost camporison with other brick it is low and also its strength is high.
- The appearance of Prosopis Juliflora brick is very attractive due to its pleasing colour like cement, uniform size and smooth finish.
- It absorb less heat and considering Indian climate, it makes it better compared to clay bricks.
- Compressive strength is very high and they are less porous. They absorb less water and saves cost there, as well.
- Construction with this provides decent sound insulation to the buildings.
- These bricks are highly fire resistant compared to normal clay bricks.

- There is no pollution or environmental damage, considered as white category product.

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