

**PREPARATION OF ALTERNATIVE BRICKS BY USING WOOD ASH AND
QUARRY DUST**G.Balaji¹, G.Sanjiv krishnan², R.Jaya prakash raj³, M.Balakrishnan⁴, J.Harikaran⁵¹ Assistant professor, Departement of civil engineering , Roever Engineering College, Perambalur.² Student department of civil engineering , Roever Engineering College, Perambalur.³ Student department of civil engineering , Roever Engineering College , Perambalur.⁴ Student department of civil engineering , Roever Engineering College, Perambalur.⁵ Student department of civil engineering , Roever Engineering College , Perambalur.

Abstract — Bricks also have been regarded as one of the longest lasting and strongest building materials used throughout history. On present day manufacturing of bricks with different material like waste material and by-product. . Our project is about partial replacement of quarry dust and wood ash with normal bricks. The main aim of our project is to compare the compressive strength of brick, light-weight bricks, minimize the cost of brick and reduce the sand material in the brick, So for this purpose sand material of 20% of wood ash and 0%, 10%, 20% & 30% of quarry dust by its volume and then the compressive strength of bricks are established, and the compressive strength of quarry dust and wood ash partially added bricks is compared with conventional bricks. Before manufacturing the bricks, different properties of the materials (sand, wood ash, quarry dust) like fineness and specific gravity was also verified. Then with the help of Universal Testing Machine (U.T.M.) finally their compressive strength is determined. Testing of bricks like compressive strength, water absorption, specific-gravity, soundness, efflorescence, hardness, structure test also be verified.

Keywords-component; clay soil, quarry dust, wood ash, water.

I. INTRODUCTION

The first bricks are made with mud bricks of sun dried and then fired bricks are found to be more resistance to harsh weather condition. The fired bricks are useful for absorption of heat through the day and then release at night. The bricks are made with standard specification of size, colour, shape, etc..,

It starts with the raw clay, preferably in a mix with 25–30% sand to reduce shrinkage. The clay is first ground and mixed with water to the desired consistency. The clay is then pressed into steel moulds with a hydraulic press. The shaped clay is then fired ("burned") at 900–1000 °C to achieve strength. For extruded bricks the clay is mixed with 10–15% water (stiff extrusion) or 20–25% water (soft extrusion) in a pug mill. The cut bricks are hardened by drying for 20 to 40 hours at 50 to 150 °C before being fired. The heat for drying is often waste heat from the kiln.

MATERIAL**CLAY SOIL**

Clay is a fine-grained natural rock or soil material that combines one or more clay minerals with traces of metal oxides and organic matter. Which it is found, clay can appear in various colours from white to dull grey or brown to deep orange-red the clay particles to fuse together **Fire Protection**. Since the primary ingredient in brick is clay which is fired to around 2000° F, it is a Non-combustible material. As such, it is an excellent cladding choice to resist or confine fires.

QUARRY DUST

Quarry dust is a waste product produced during the crushing process which is used to extract stone. It is rock particles. When huge rocks break in to small parts for the construction in quarries. It is like sand but mostly grey in color. It is mineral particles. The density of Quarry dust is 1650 kg/m³.

WOOD ASH

Wood ash is the residue powder left after the combustion of wood, such as burning wood in a home fireplace or an industrial power plant. It is used traditionally by gardeners as a good source of potash. Many studies have been conducted regarding the chemical composition of wood ash, with widely varying results. Some quote calcium carbonate (CaCO_3) as the major constituent, others find no carbonate at all, but calcium oxide (CaO) instead

CHEMICAL PROPERTIES OF BRICKS

The bricks normally used as building made of bricks also has some financial advantages. Houses made entirely out of brickwork cost less in the long run, because they need less energy for heating. Normally, bricks contain the following ingredients

1. Silica (sand) = 50% to 60% by weight
2. Alumina (clay) = 20% to 30% by weight
3. Lime = 2 to 5% by weight
4. Iron oxide = $\leq 7\%$ by weight
5. Magnesia = less than 1% by weight

OBJECTIVES

- To determine eco-friendly bricks and economic bricks.
- To study the strength of the brick.
- To study the behaviors of bricks by adding various materials like mud, quarry dust, wood ash.

II. TESTING OF RAW MATERIALS

Fineness test

The fineness of the materials to be calculated by 150 micron sieve. First we take 100 grams fly ash in sieve and it sieved for 10 minutes. The retained fly ash content weight is noted. The fineness value was calculated. Fineness of other materials is to be determined. So same procedure is repeated for other materials.

Specific gravity test

Specific gravity of fly ash is made use of in design calculations of mixes. With the specific gravity of each constituent known, its weight can be converted into solid volume and hence a theoretical yield of brick per unit volume can be calculated. Specific gravity of other materials is to be determined. So same procedure is repeated for other materials.

Bulk density test

Bulk density of fly ash is made use of in design calculations of mixes. With the Bulk density of each constituent known, its weight can be converted into solid volume and hence a theoretical yield of brick per unit volume can be calculated. Same procedure is repeated for other materials.

III. MIXING PROPORTION

The design mix proportion is done in below

SAMPLE	CLAY MATERIAL	WOOD ASH	WATER RATIO	QUARRY DUST
1	80%	20%	0.5%	0%
2	70%	20%	0.5%	10%
3	60%	20%	0.5%	20%
4	50%	20%	0.5%	30%
5	100%	20%	0.5%	0%

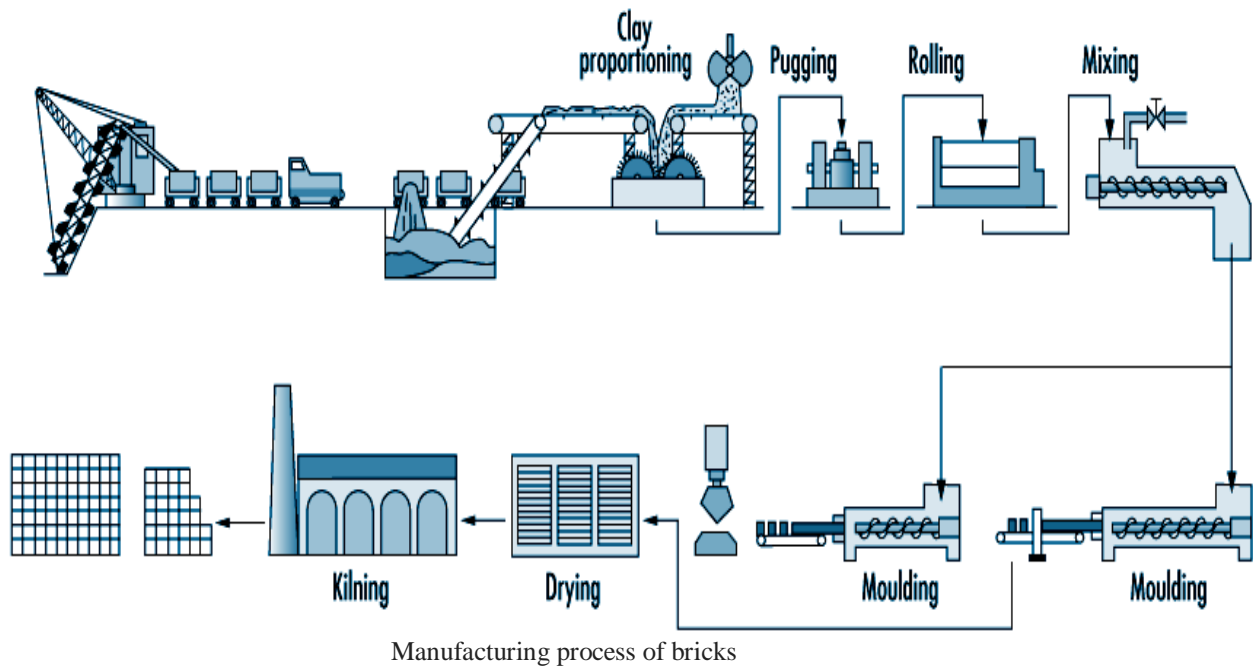
MANUFACTURING PROCESS

There are four different operations are involved in the process of manufacturing of bricks:

1. Preparation of clay
2. Molding
3. Drying
4. Burning

EXPERIMENTAL METHODOLOGY

The evaluation of bricks by using wood ash and quarry dust is partial replacement of bricks. The brick contain clay soil, wood ash and quarry dust are used with replacement of 20% of wood ash and 10%, 20%, 30% of quarry dust is replacement of normal bricks. The bricks sample having size of (190x90x90)mm. the preparation of bricks



IV. TESTS ON BRICK

As per IS 3495: 1992, the following laboratory tests are conducted on bricks.

1. Compressive strength test
2. Water absorption test
3. Efflorescence test

And also some of the site tests are also conducted on bricks.

1. Soundness test
2. Structure test
3. Hardness test
4. Shape and Size test for brick
5. Color test

COMPRESSIVE STRENGTH TEST

The specimen is placed with flat faces horizontal, and mortar filled face facing upwards between two 3 plywood sheets each of 3mm thickness and carefully centered between plates of the testing machine. The load is applied axially at a uniform rate of 14N/mm² (140kg/cm²) per minute till failure and the ultimate load failure is noted.

Table 5.1 compressive strength of normal bricks

S.No.	Size of specimen (mm)	Ultimate load (N)	Cross-sectional area (mm ²)	Ultimate compressive strength (N/mm ²)
1	190x90x90	125172	17100	7.32
2	190x90x90	127908	17100	7.48

Average compressive strength = 7.4 N/mm²

Table 5.2 compressive strength of 20% wood ash and 0% quarry dust

S.No.	Size of specimen (mm)	Ultimate load (N)	Cross-sectional area (mm ²)	Ultimate compressive strength (N/mm ²)
1	190x90x90	117135	17100	6.85
2	190x90x90	118674	17100	6.94

Average compressive strength = 6.895 N/mm²

Table 5.3 compressive strength of 20% wood ash and 10% quarry dust

S.No.	Size of specimen (mm)	Ultimate load (N)	Cross-sectional area (mm ²)	Ultimate compressive strength (N/mm ²)
1	190x90x90	124146	17100	7.26
2	190x90x90	125856	17100	7.36

Average compressive strength = 7.31 N/mm²

Table 5.4 compressive strength of 20% wood ash and 20% quarry dust

S.No.	Size of specimen (mm)	Ultimate load (N)	Cross-sectional area (mm ²)	Ultimate compressive strength (N/mm ²)
1	190x90x90	135432	17100	7.92
2	190x90x90	134064	17100	7.84

Average compressive strength = 7.88 N/mm²

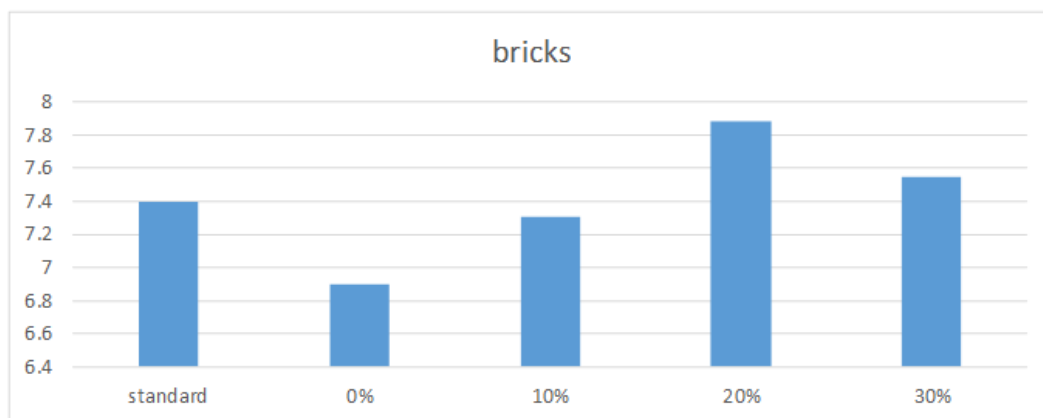
Table 5.5 compressive strength of 20% wood ash and 30% quarry dust

S.No.	Size of specimen (mm)	Ultimate load (N)	Cross-sectional area (mm ²)	Ultimate compressive strength (N/mm ²)
1	190x90x90	127737	17100	7.47
2	190x90x90	130302	17100	7.62

Average compressive strength = 7.545 N/mm²

Table 5.6 Test Result for Bricks

S.No.	Brick type	Size of specimen (mm)	Compressive load (N)	Compressive strength (N/mm ²)
1	Normal	190x90x90	126540	7.40
2	0%quarry dust	190x90x90	117990	6.90
3	10%quarry dust	190x90x90	125001	7.31
4	20%quarry dust	190x90x90	134748	7.88
5	30%quarry dust	190x90x90	129105	7.55



WATER ABSORPTION TEST

Absorption test is conducted on bricks to find out the amount of moisture content absorbed by brick under extreme condition. In this test sample dry bricks are taken and weighted. After weighing these bricks are placed in water with full immersing for a period of 24 hours. Then weight the wet bricks and note down the value. The different between dry and wet bricks weights will give the amount of water absorption should not exceed 20% of weight of dry bricks

Table 5.7 Water absorption test on brick

S.No	Quarry dust in Percentage (%)	Dry weight of Bricks in Kg	Wet weight of bricks in Kg	Water Absorption In percentage (%)
1	0	2.384	2.745	13.1
2	10	2.452	2.875	14.7
3	20	2.754	3.204	14.0
4	30	2.805	3.231	13.1
5	Normal	3.070	3.410	9.9

EFFLORESCENCE TEST

A good quality of bricks should not contain any soluble salt in it. If soluble salts are there, then it will cause efflorescence on bricks surface.

SOUNDNESS TEST

In this test two bricks are held by both hands and struck with one another. If the bricks gives clear metallic ring metal sound and don't break, then those are good quality bricks.

STRUCTURE TEST

In this test a brick is broken or a broken brick is collected and closely observed. If there are any flaws, cracks or holes present on that broken face, then that is not good quality brick.

HARDNESS TEST

In this test scratch is made on brick surface with finger nail. If that does not leave any impression on brick, then that is good quality brick

SHAPE AND SIZE TEST ON BRICKS

Shape and size of bricks are very important consideration. All bricks used for construction should be of same size. The shape of bricks should be same size, the shape of bricks should be purely rectangle with sharp edges. Standard size of bricks consist of length x breath x height as 19cm x 9cm x 9cm to perform the test.

COLOR TEST OF BRCKS

A good bricks should bright and uniform color throughout its body

V. CONCLUSION

Observations are made regarding the resistance of partially replaced of quarry dust and wood ash. From laboratory tests, maximum compressive strength is 7.88 N/mm^2 obtained at 15% replacement (Type 3) of bricks, type 3 bricks have more strength than other type bricks. The further additional replacement of quarry dust decreases the compressive strength of the bricks. Compressive strength changes on increase in percentage of quarry dust and wood ash as compared to bricks. Water absorption of the bricks increases with increase with normal bricks.. Use of brick can solve the disposal problem reduce cost and produce a 'greener' Ecofriendly bricks for construction. Environmental effects of wastes and disposal problems of waste can be reduced through this research.

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