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Experimental Investigation using Different Waste Material on Bricks

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Abstract: This study has been undertaken to investigate the use of waste materials use for the manufacturing of bricks. To test the. Ground-granulated blast slag is obtained by quenching molten iron slag from a furnace in water to supply a glassy, granular product that's then dried and ground into a fine. Bricks also have been regarded as one of the longest lasting and strongest building materials used throughout history. Ordinary building bricks are made of a mixture of clay, which is subjected to various processes, differing according to the nature of the material, the method of manufacture and the character of the finished product. After being properly prepared the clay is formed in moulds to the desired shape, then dried and burnt. So with the increase in the demand of the bricks in the industry so from different waste materials the bricks have been be made and comparing the different properties of bricks. The Proportion within the mix is cement and demolished concrete dust is remained constant. The proportion of Rice Husk Ash, Ground Granulated Blast Slag is to be used was 10%, 20%, 30% and 40%. During this experimental investigation was carried out on bricks using different waste Material. The 10%Rice Husk ash + 40% Ground granulated blast slag have high compressive strength and low water absorption among the different mix samples. To make this bricks using different waste materials and to determine the compressive strength, Dimensional tolerance, water absorption and Efflorescence test of bricks.

Index Terms **– Rice Husk Ash, Compressive Strength, Water Absorption.**

I. Introduction

Bricks are used to construct wall, pavements and other elements in masonry construction. A brick is composed of soil consisting of sand, clay, lime or concrete materials. Rice husk a major by-product of the rice milling industry, is one of the most commonly available materials. Rice husk is an agricultural residue abundantly available in rice producing countries. The Rice husk ash is found as natural materials by products or industrial wastes. This rice husk is mostly used as a fuel in the boilers for processing of paddy. Rice husk is also used as a fuel for power generation. Rice husk ash (RHA) is about 25% by weight of rice husk when burnt in boilers. It is estimated that about 70 million tons of RHA is produced annually worldwide. This Rice husk ash is a great environment threat causing damage to the land and the surrounding area in which it is dumped. This husk is used as fuel in the rice mills to generate steam for the parboiling process. This husk contains about 75 % organic volatile matter and the balance 25 % of the weight of this husk is converted into ash during the firing process, is known as rice husk ash (RHA). The compressive strength of brick is done at 28 days. The replacement materials are done by 10% RHA+40%GGBS, 20%RHA +30%GGBS, 30%RHA+20%GGBS, 40%RHA+10%GGBS.The most of research is used to form economical and environmental friendly

II.MATERIALS

For developing a mix, it is important to select proper ingredients, evaluate their properties and understand the interaction among different materials for optimum usage. The materials used for this investigation were cement, Rice Husk Ash, Ground granulated blast slag, water and Demolished concrete dust.

2.1 Cement

Cement may also globally used as a binding material. Cement is often used in binding sand and gravel together It is used in for construction which helps in setting hardens and combines with other supplementary materials, binding them together strongly. Cement is combining with fine aggregate particles to arrange the mortar for civil works, or with sea or river sand particles and gravel aggregates to arrange concrete mix.

Table: 2.1 Physical properties of the OPC

Sr No	Particulars	Results (IS 12269-1987)
1	Specific gravity	3.15
2	Initial time (min)	120
3	Final Time (min)	205
4	Normal consistency (%)	30

Figure: 2.1 Cement

2.2 Ground Granulated Blast Slag

Ground granulated blast slag (GGBS) is obtained by quenching molten iron slag a byproduct of iron and steel-making from a blast furnace in water to produce a glassy, granular product. Then it's dried and grinded into fine powder. The components of blast furnace slag are CaO, SiO_2, Al_2O_3 and MgO. Ground granulated blast slag is white in colour. The Specific Gravity is 2.40.

Figure: 2.2 Ground Granulated Blast Slag

2.3 Demolished Concrete Dust

Demolished Concrete dust is an alternative for river sand. In this growing construction industry the demand for sand has increased vastly, causing decrease of river sand in most part of the world. Concrete dust is produced from demolished concrete by crushing and making fine aggregates. The size of Demolished Concrete dust is less than 4.75mm and retain on 600micron.The Specific Gravity is 2.36.

2.4 Rice Husk Ash

Rice husk ash is obtained by burning rice husk in a very controlled manner without causing any environment pollution. The Colour of this Rice husk ash is grey and the size of Rice Husk ash is 25microns. This Rice Husk ash contains around 85 % - 90 % amorphous silica. The particle size of cement is about 100 microns as to Rice Husk Ash .So that the Rice Husk ash can fills that voids formed by cement. The Specific gravity is 2.10.

Figure: 2.3 Rice Husk Ash

III. METHODOLOGY

Preparation of detail work plan on the details of the properties of material and waste materials. Different sorts of bricks to direct all kind of test with respect to quality. The measurement of bricks is 190mm x 90mm x 90mm. All materials are mix like cement, Ground Granulated Blast Slag, Rice Husk Ash, water, Demolished Concrete and are placed in brick mould. The brick mould were removed and marked with symbol to identify later. The different mix design has been made in below table.

Table: 3.1 Different mix proportions of brick

Sample No	Cement	Demolished Concrete Dust	Rice Husk Ash	Ground Granulated Blast Slag
A	20%	30%	40%	10%
B	20%	30%	30%	20%
C	20%	30%	20%	30%
D	20%	30%	10%	40%

Figure: 3.1 Bricks

IV. RESULTS

4.1 Compressive Strength

The Compressive strength of bricks is determined the compressive strength of brick. In compression testing machine the bricks are placed. The load is applied till the brick breaks. The compressive strength of bricks is done at 28 days. The Compressive Strength of bricks increases with the increase of percentage of Ground Granulated blast slag and decrease of compressive strength with the increase in percentage of Rice Husk Ash.

Table: 4.1 Table of Compressive Strength of Bricks

Sample No	Compressive Strength N/mm^2
A	1.92
B	2.21
C	3.31
D	8.23

Figure: 4.1 Compressive Test Machine

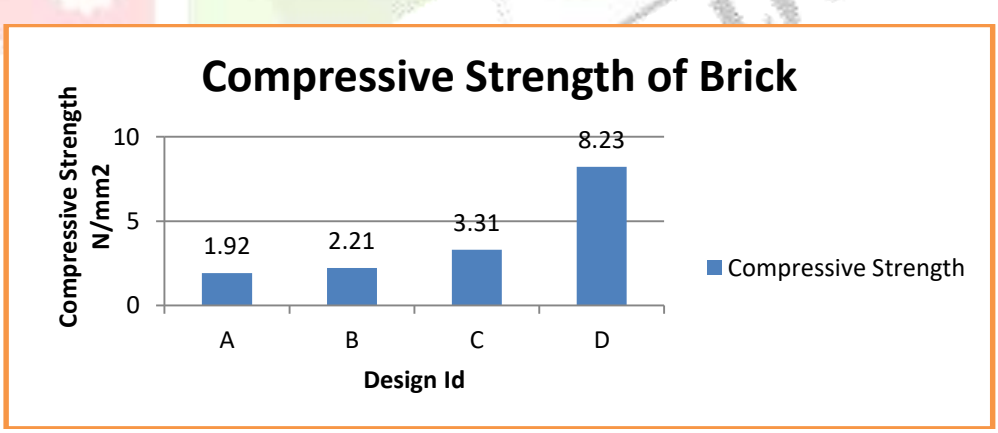

Figure: 4.2 Compressive Strength of Bricks

4.2 Water Absorption

The test is done on brick to find out the amount of moisture content absorbed by the brick. In this water absorption test sample dry bricks are taken. The weight is noted and after the weighing these bricks are placed in water with full for 24 hours. The bricks are removed and the weight is noted. The Water Absorption of brick is increased with the percentage of Rice Husk Ash and decrease of water absorption with the increase of the percentage of Ground Granulated Blast Slag.

Table: 4.2 Table of Water Absorption of bricks

Sr No	Sample No	Water Absorption (%)
1	A	25.07
2	B	22.79
3	C	12.10
4	D	6.05

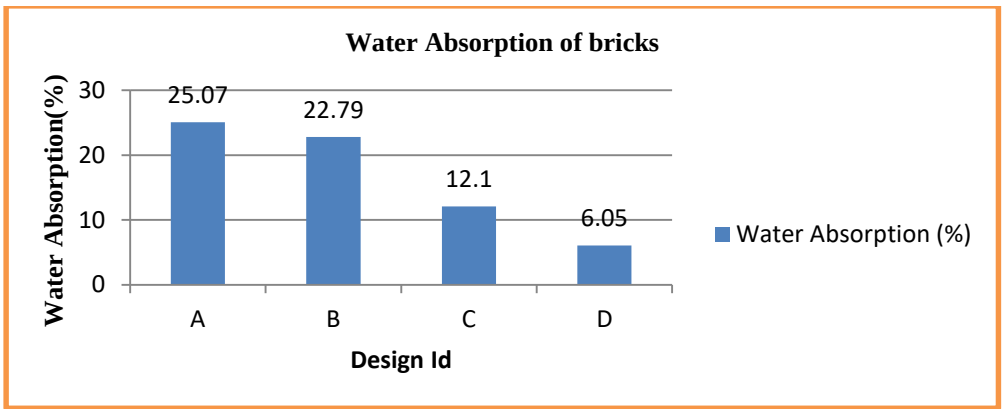

Figure: 4.3 Water Absorption of brick

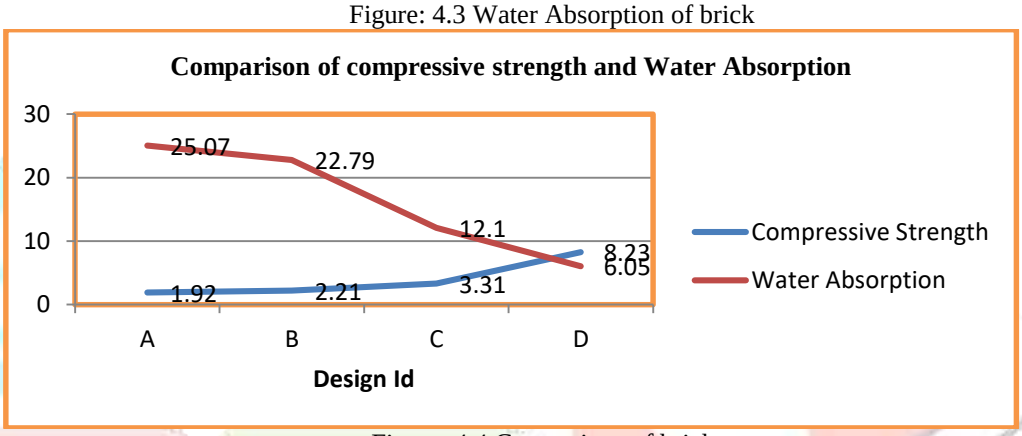

Figure: 4.4 Comparison of bricks

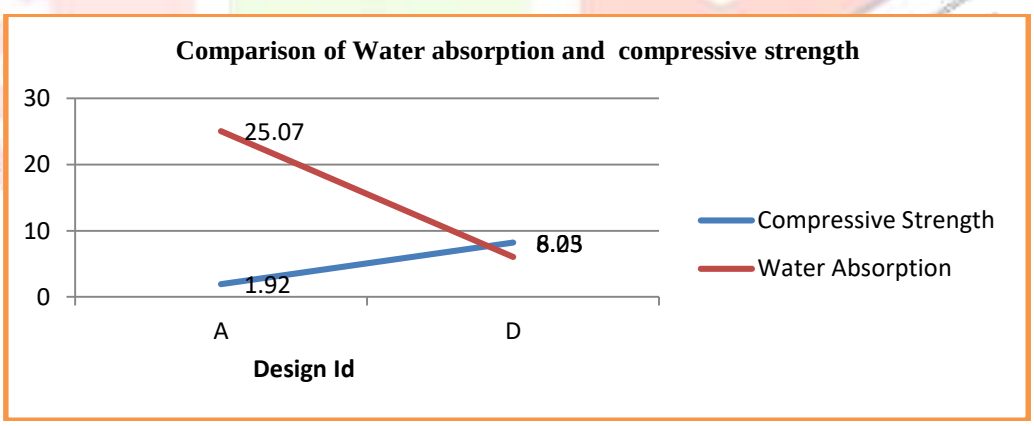

Figure: 4.5 Comparison of Water absorption and compressive strength of Sample A and D

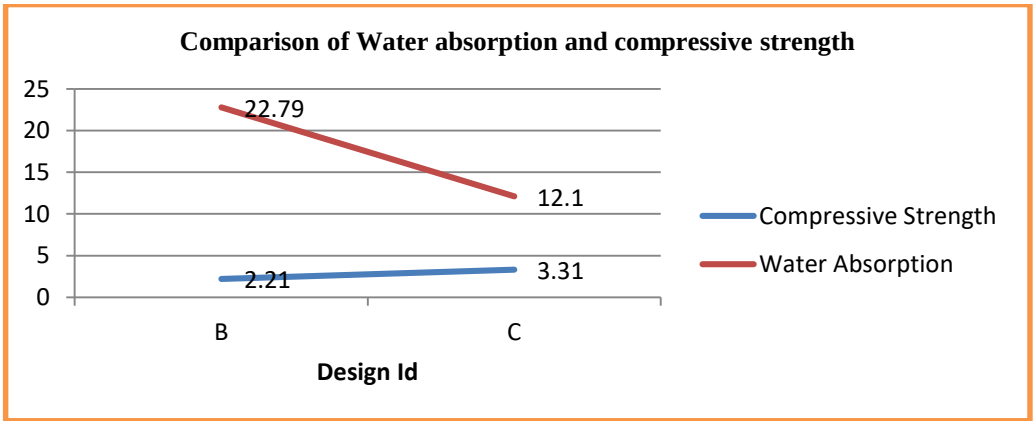

Figure: 4.6 Comparison of water absorption and compressive strength of sample B and C

4.3 Efflorescence Test

In Efflorescence the brick should not contain any soluble salts in it. If soluble salts are there then it will cause efflorescence on brick surfaces and not useful for construction. The Efflorescence results are nil in bricks.

4.4 Dimensional Tolerance

The Shape and Size of bricks is very important consideration. All the bricks which to be used for construction should be of same size and the shape of bricks should be rectangular with sharp edges.

Table: 4.3 Table of Dimensional Tolerance

Sample No	**Width (mm)**	**Height (mm)**	**Length (mm)**	**Dimensional Tolerance**
A	1784.55	1780.54	3867.45	Length=3800+/-80mm Width=1800+/-40mm Height=1800+/-40mm
B	1780.45	1775.17	3861.54	
C	1781.98	1776.91	3760.48	
D	1757.17	1773.25	3880.54	

V. CONCULSION

The bricks with the 40%+10% Ground Granulated Blast Slag and Rice Husk Ash have the highest compressive strength. The bricks with the 40% +10% Rice Hush Ash and Ground Granulated Blast Slag have the highest the Water Absorption. The decrease of water absorption and increase of the compressive strength is with increase the percentage of Ground Granulated blast slag and decrease in the percentage of Rice Husk ash. The Efflorescence test of the all the bricks is nil. The brick with the high compressive strength has the low water absorption and the brick with low compressive strength has the high water absorption.

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