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EXPERIMENTAL INVESTIGATION OF BRICKS USING LITHOMARGIC CLAY,FLY ASH AND EGG SHELLS AND CEMENT BLOCKS WITH EGG SHELLS.

1.Ashiq P T, 2. Prof:A.Kumar,M.E.,(Phd)
1.ME Student, JCT, Anna University,India
2.Professor, JCT, Anna University,India

Abstract:

GreenIt is a generally known that all the bricks that are manufactured only contain clay or cement, sand and stone as its major constituent, due to this a large amount of fertile clay or sand and stone is being used for the making of bricks. In order to reduce the percentage of clay in the brick we are in search of an alternative that could be used along with clay. In this aim, we have chosen "**FLY ASH**", "**LITHOMARGIC CLAY**" and "**EGG SHELL**". The reason for choosing FLY ASH because it's one of the major pollutant coming from the thermal power plant and other industries which uses coal as a fuel to burn. EGG SHELL is chosenbecause it contains CALCIUM CARBONATE in larger proportion. This chemicalsubstance is able to increase the bond strength. Moreover, we also aim in reducing the cost of the brick. By adding the above ingredients, the cost of the brick could be reduced effectively. In this project, we have chosen the ground moulding technique which easier for manufacturing the brick. Thus in this project we have used the waste byproductalong with clay in order to reduce the percentage of clay and also for reducing the cost effectively without affecting the strength of the brick. Also considering the egg shell powder as a partial replacement material in cement bricks. Also along with it the cement blocks are also made and their strength is calculated concrete are generally composed of recycling materials as hundred or partial percent substitutes for aggregate, cement, and admixture in concrete..

1 INTRODUCTION

The bricks are obtained by moulding clay in rectangular blocks of uniform size and then by drying and burning these blocks. As bricks are of uniform size, they can be properly arranged and further, as they are light in weight, no lifting appliance is required for them. The bricks do not require dressing and the art of laying bricks is so simple that the brickwork can be carried out with the help of unskilled labourers. Thus, at places where stones are not easily available, but if there is plenty of clay suitable for the manufacture of bricks, the bricks replace stones.

As considering a structure bricks are to be used.The common brick is one of the oldest building materials and it is extensively used at present as a leading material of construction because of its durability, strength, reliability, low cost, easy availability, etc.

The bricks seem to have been produced since the dawn of the civilization in the sun-dried form. The Great Wall of China (210 B.C.) was built with both, burnt and sun-dried bricks. The other examples of the use of bricks in early stage of civilization could be cited in Rome and other places.

The medieval cities were of wood and because of the disastrous fire potential of wood; the bricks replaced the wood over the years. For instance, the great fire of London in 1666 changed London from being a city of wood to one of brick. A number of country farmhouses still exists in Great Britain and profess the monuments of the excellent hand-made bricks.

The bricks have been used all over the world in every class and kind of building. If the total bricks produced until today are to be counted the figure would indeed be astronomical. At present, India has the production capacity to manufacture over 10000 crore bricks through about 45000 local kilns in the unorganized sector. It is understood that about 65 per cent of the bricks in the world goes into dwellings and the balance into commercial, industrial, and institutional buildings.

In India, the process of brick making has not changed since many centuries except some minor refinements. There have been hardly any efforts in the country to improve the brick-making process for enhancing the quality of the bricks. The main reason for this attitude is that the production of bricks has been largely remained confined to the unorganized small sector. Some of the large mechanized brick plants came up in the past. However, they seem to have gone sick for some reason or the other. The result is that the construction industry in the country is largely dependent on the small sector, which is unable to deliver high quality bricks in view of rising fuel cost, outdated technology, and lower efficiency of production.

The items related to this important building material will be discussed with a special note on the brick substitutes, which

are thought of at present.this paper Limestone waste is used as the partial replacement for sand in the manufacturing of concrete. Geotechnical properties of sand.

2 OBJECTIVES

1. To develop the independent creative thinking and theoretical

knowledge that we have obtained during the

2. To reduce the percentage of clay.

3 .To compare the result with standard bricks available.

4. Use of unwanted materials and reducing the cost without affecting the strength.

5. Here the egg shell is chosen because it contains calcium carbonate which increase the bond strength.

6. For the proper use of pollutant.

7.To find out the suitable and effective replacement material for fine aggregate in the Production of concrete

8. To find out the possible utilization of waste materials in the construction industry that in turn minimizes the usage of scarcely

9.Available natural resources

10. To cut down the construction cost by using abundantly available free materials in the production of concrete

11. To find out the better way of utilizing waste materials and eliminate the problem of disposal and solid waste management.

3 MATERIALS USED

Several materials are used to manufacture good quality bricks. It is important to know the properties of clay ,cement, fine aggregate, coarse aggregate and water as they impart strength and durability to concrete. Of all the materials that influence the behavior of concrete, cement is the most important constituent, because it is used to bind Sand, waste and coarse aggregate and it resists atmospheric action. In this chapter we will study the properties of all the major raw materials used to make bricks and cement blocks..

Fly Ash

Fly ash (also known as a coal combustion product or CCP) is the finely divided mineral residue resulting from the combustion of powdered coal in electric generating plants. It is also called pulverized fuel ash. Fly ash consists of inorganic, incombustible matter present in the coal that has been fused during combustion into a glassy, amorphous structure. Coal can range in ash content from 2%-30%, and of this around 85% becomes fly ash. (The remaining 15% is called bottom ash and is not lifted up by the flue gases.)

Fly Ash and lithomargic clay in Clay Bricks

Fly ash is being used in the production of some bricks because it can improve the plasticity of the clay so that plant production rates can be increased and because the carbon in the fly ash reduces the fuel to fire the bricks. In addition, the addition of fly ash acts similarly to grog (pulverized reject brick) in that it reduces the shrinkage of the brick that takes place during the firing process. This latter aspect is of particular advantage when making hollow blocks, roofing tiles and clay flowerpots.

CEMENT

The major raw material for the production of cement is clinker. Clinker is an artificial stone made by heating other raw materials in specific quantities to a very high temperature in a high temperature kiln. Portland cement is hydraulic cement made by finely pulverizing the clinker produced by calcining to incipient fusion a mixture of argillaceous and calcareous materials. It is a fine grey powder that is the most important ingredient of concrete; hence it is named cement concrete. Cement undergoes a chemical. reaction with water and sets and hardens when it contacts with air or underwater. Ordinary Portland cement (OPC), 53 grade was used for the entire experimental investigation. The required quantity for this work was assessed and the entire quantity was purchased and stored properly in casting yard and used for the experimental investigation. The physical properties of the above tested according to standard procedure, conforms to the requirement of IS: 12269 -1989. The physical properties of the above cement are given in table.

FINE AGGREGATE

The fine aggregate are inert materials. They contribute to both stiffness and weight of concrete. In India river sand is preferred as fine aggregate. Of late, the lack of availability of river sand has led to the use of artificial sands, especially in southern states such as Tamilnadu. The physical, chemical and thermal properties of aggregates are substantially influence the performance of concrete. The fine aggregate used in this study are clean river sand,passing through 4.75mm sieve with properties presented in table.

WATER

Water is the next most important ingredient after cement for making concrete. It is also least expensive. Careless use of water can lead to poor quality of concrete. Therefore, a detailed study of the quality and quantity of water required for making good quality concrete is essential. Water acts as a lubricant for the fine and coarse aggregate and acts as chemical cement to form the binding paste for the aggregate water is used for curing the concrete after it has cast into forms. Water used for both miming and curing should be free from injurious amount of deleterious materials. Portable water is generally considered satisfactory for mixing and curing of concrete. If water contains any sugar or excess of acid or salt, it should not be used. Ordinary tap water is used for preparation of concrete.

4 EXPERIMENTAL WORK

The work was carried under three phases.

In first phase ,bricks were collected from 6 different sites, these bricks were tested for compressive strength as per IS 3495 (1 and 2)1992 .

In the second phase soil samples were collected . The soil samples were collected from the heap at approximate depth of 1 m and 8 m from its top.Fresh fly ash was collected.

In the third phase , the bricks of size 220mm x 100 mmx70mm were cast in laboratory using fly ash ,eggshell and soil samples from different sites.

The sample was mixed with sufficient quantity of water.

The soil lump was dashed into clean mould kept on levelled ground. The surplus clay was removed and top surface was levelled.

The moulded bricks are allowed to dry in air protecting from direct sun. Test are conducted.

5 METHODOLOGY

DATA COLLECTION

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COLLECTION OF MATERIALS.

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TESTING OF MATERIALS.

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MIXING WITH SPECIFIC PROPORTION

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MOULDING OF SPECIMEN

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DEMOULDING OF SPECIMEN

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TESTING O F SPECIMEN

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RESULT ANALYSIS AND CONCLUSION

6 TESTS

A brick is generally subjected to the following tests to find out its suitability for the construction work:

Absorption
Compressive strength
Hardness
Presence of soluble salts
Shape and size
Structure

COMPRESSIVE STRENGTH TEST

The compressive strength test is the most common test conducted because most of the desirable characteristic properties of brick and concrete and the structural design purpose are qualitatively related to compressive strength. The test was conducted in compression testing machine as per the specification given in IS under normal room temperature. The capacity of compressive testing machine was 20 tones. The cubes were properly held in position such that the load is applied uniformly over the surface. The load was applied gradually till the ultimate load is reached. The ultimate load was noted and from that the compressive strength was calculated using following formula

Compressive load strength =Ultimate Load /Cross Section Area N/mm2

SPLIT TENSILE TEST

According to split tensile strength, the cylinders were dealt with circumferential load and the results were noted by using formula. The split tensile strength is given by formula 2p/ ΠDL and the stress value is obtained in N/ mm². P is the ultimate load at which the cylinder fails D and L are the diameter and length of the cylinder Split tensile strength = 2P/ 3.14 LD N/ mm2

Test results

In the above test by increasing amount of fly ash and decreasing the amount of egg shell was carried,use of fly ash increases the compressive strength.

The egg shell increases the bond strength.

The above tests are carried out for the ground-moulded brick. Totally, 12 brick specimens were manufactured and tested.From the above test results, the maximum crushing strength of 9.25 N/ mm2 attained by the 5th set of the test specimen. This is of under IS 1077-1992

The above tests are carried out for the ground-moulded brick. Totally, 5 brick specimens were manufactured and tested.

From the above test results, the maximum crushing strength of 9250 N/ mm^2 attained by the 3rd set of the test specimen.

7 CONCLUSION

It is found that the test specimens attain the compressive strengths comparable to the conventional bricks.

If this project is commercialised the extensive amount of the fly ash and eggshell could be effectively used.

Thus by doing the same, use of soil will be reduced. Thus we are able to preserve the soil. Moreover, in the economical point of view the manufacturing cost could be reduced.

If this procedure of brick making is mechanised under standard manufacturing conditions, the strength may increase by considerable amount. Offers a solution to the problem of waste disposal as well as eco friendly environment in the construction industry.From the results it was shown that mixes tested with egg shell had properties, workability, strength & modulus of elasticity comparable to those of nominal concrete.

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