An Experimental Investigation on Partial Replacement of Fine Aggregate By Using Brick waste in Concrete

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Abstract- *Several million tons of solid waste are produced each year due to construction and demolition activities worldwide and brick waste is one of the widest waste recently a growing number of studies have been conducted on using recycling brick waste to produce environment friendly concrete. The use of brick waste as potential partial cement or aggregate replacement material summarized in this review where,the performance is discussed in the form of the mechanical strength and properties related to the durability of concrete . It can be utilized as a sand substitute in replacement level up to 10%. It develops the durability of concrete in some cases when used with replacement level of up 0% (C.C),5%,10% by the weight of fine aggregate by using M20 grade of concrete*

I. LITERATURE REVIEW

J.A.Cusido et al. (2003) Developed lighter , more thermal and acoustic insulating clay brick, compared with conventional clay bricks by mixing clay with sewage sludge, and forest debris. Bricks were dried at100 C and then fired at 1000 C. It was shown that level of emissions of green house gas was 20 time higher than the conventional ceramic body with different properties of sludge . results for mechanical properties production agency recommendations. produced clay bricks from very different clay, calcareous sand non calcareous. samples were obtained by three processes pressing, extrusion and firing at 110 C. the mechanical resistance, pore size distribution and critical pore diameter didn't clearly reflect the influence

Martinez et al. (2012) replaced clay in concrete with different position sludge. results for mechanical properties as water absorption , compressive strength and water suction showed that the bricks incorporated 5% of sludge showed good mechanical properties.

Michele et al, (2010) studied the potential utilization of tionite as coloring agent in clay bricks. Samples were dried at 100^0C and then fired at 1000^0C . additions over of 5% tionite induced significant variations,such as increase of working moisture and water absorption , decrease of bulk density and bending strength.

Ismail et al,(2003) studied the addition of waste brick material to clay bricks. the results showed that the reuse of this material in bricks industry good contribute to the protection of farmland and the environment.

Pai- Haung et al, (2004) manufactured bricks from clay and steel slag . result showed that when the firing temperature was greater than 1050^0C and the slag addition less than 10%, the bricks met the Chinese national standards for third-class bricks for build.

II. INTRODUCTION

The increase in the popularity of using environmental friendly low cost and lightweight how this can be achieved benefiting the environment as well as maintaining the material activities as building materials appears to be viable solution not only to such pollution problem used by the sector as well as by the large volume of products in construction.

Scope:

The review of literature indicates that the concrete building brick enhances its various mechanical properties, dimensional stability and structural integrity. Brick waste can be ground into tiny particles to be used in mortar.It can in two forms: CBP (customs and border production) The former exhibits activity to yield a denser mixture, and the later can be used as sand previous studies. Brick production is huge across the global its being used widely for the for any types of structure due to the its versatility.

Objectives of study:

Investigation of utilization of brick waste as additional material in concrete mixes to be used for various construction projects , ensuring that the resulting concrete has proper compressive strength.To prepare mixes containing various proportions of the brick waste. To determine the fresh

concrete properties such as slump value , compaction factor.To determine the hardened concrete such as compressive strength test , split tensile strength test and flexural strength test. Comparison of results conventional concrete and hardened concrete.

Methodology:

Cement:

The hydration process is caused by the dissolution of clinker cement minerals in a certain volume of water a solvent,and then crystallization of or dynamically stable compounds from supersaturated solutions.it can bind other materials together. Cements used in construction can be characterized as being either hydraulic or non- hydraulic. Hydraulic cements harden because of hydration, a chemical reaction between the cement powder and water. Thus, they can harden underwater or when constantly exposed to wet weather. 43 grades cement is used for the study our project.

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Fine aggregate:

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. The composition of sand is highly variable, depending on the local rock sources and conditions, but the most common constituent of sand is inland .The purpose of the fine aggregate is to fill the voids in the coarse aggregate and to act as a work ability agent. River sand was used in preparing the concrete as it was locally available in sand quarry. The properties of this fine aggregate have been tested and given below.

Coarse aggregate:

Crushed stone or angular rock is a form of construction aggregate, typically produced by mining a suitable rock deposit and breaking the removed rock down to the desired size using crushers. It is distinct from gravel which is produced by natural processes of weathering and erosion and typically has a more rounded shape. Angular crushed stone is the key material for macadam road construction which depends on the interlocking of the individual stones angular faces or its strength.

Brick waste:

The clay brick waste can be ground into tiny particles to be used in concrete for alternative for fine aggregate.Former exhibits activity to denser mixture and also used for sand replacement. the properties of brick waste is used to supported mixed proportion

Water:

Portable tap water available in laboratory with pH level of 7.0 to 1 confirming to the requirement of IS:456-2000 was used for mixing concrete and curing the specimens as well.Hydration involves many different reaction,often occurring at same time.

Material test:

Fine aggregate:

Specific gravity = 2.75

Fineness modulus = 2.81

Coarse aggregate:

Specific gravity = 2.69
Fineness modulus = 3.09

Cement:

Consistency = 35%
Initial setting time = 25 minutes

Casting of specimen:

Compressive strength:

Cube mould of size 150 x 150 x 150 mm were castled and allowed for curing in a curing tank for 28 days and they were tested at 7, 14 and 28 days. These cubes were tested on compression testing machine as per I.S. 516-1959.

Cube compressive strength (fck) in MPa = PA

Where,

P = Cube compression load
A= Area of the cube

Calculations:

Compressive strength test:(CC):
For 7 days,
Reading on dial-Gauge = 330 KN
= 330,000 N
Surface area of concrete cube
Area = length * width
=150*150
= 22500 mm^2
pressure =Load /Area = 330,000/22500
=14.66 N/mm^2
0% conventional concrete for compressive strength achieve in 14.66 N/mm^2.

Calculation:

Compressive strength test:

(5% For 7 days)
For 7 days,
Reading on dial-Gauge = 290 KN
= 290,000 N
Surface area of concrete cube
Area = length * width
=150*150
= 22500 mm^2
pressure =Load /Area = 290,000/22500 = 12.88 N/mm^2
5% of fine aggregate with brick waste for compressive strength achieve in 12.88N/mm^2.

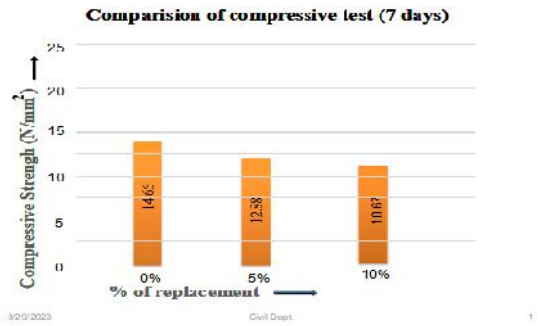
Calculation:

Compressive strength test:

(10% For 7 days)
For 7 days,
Reading on dial-Gauge = 240 KN
= 240,000 N
Surface area of concrete cube
Area = length * width
=150*150
= 22500 mm^2
pressure =Load /Area = 290,000/22500
= 10.67 N/mm^2
10% of fine aggregate with brick waste for compressive strength achieve in 10.67N/mm^2.

Compressive Test:

Result in compressive test for 7days (cube):



III. CONCLUSION

In this replacement of 5% gave better result use of brick waste in concrete can prove to be economical as it is non useful waste and free of cost use of brick waste in concrete eradicate the disposal problem of brick waste, reduce over produce of brick by manufacture to ensuring environmental friendly and paving way of greener concrete will pressure natural resource that use for cement manufacture and those makes concrete will sustainable , also disposal problem From the result of compressive strength, flexural strength, the value range should be increases for 5% replacement of cement using Brick waste on 7 days test compare to CC increased with the increase in brick waste content of cement replacement at same.water-cement ratio. The Compressive strength of concrete has increased up to 65% by the comparing normal Conventional Concrete. The Flexural strength of concrete has increased to 2.98% by Comparing normal Conventional Concrete Brick waste (5%,10%). for brick waste for this waste material is fully solved.

From the result of compressive strength,

0% conventional concrete for compressive strength achieve in 14.66 $N/mm^{2.}$

5% of fine aggregate with brick waste for compressive strength achieve in 12.88$N/mm^{2.}$

10% of fine aggregate with brick waste for compressive strength achieve in 10.67N/mm^2.

REFERENCES

[1] AL-Tayeb MM,Bakar BHA,ismail H and Akil HM(2013) Effect partial replacement of sand by recycled
[2] fine crumb rubber the performance of hybrid rubberized-normal concrete under impact load : experiment and simulation . journal of cleaner production 59 : 284-289.
[3] Bogas JA , Brito JD and Figueiredo JM(2015) Mechanical characterization of concrete produced with recycled lightweight expanded clay aggregate concrete. journal of cleaner production 89:187-195.
[4] Brown NOW , Malmqvist T, bai W and W Molinari M (2013) sustainability assessment of renovation package for increased energy efficiency for multi- family building in sweden. 61(1):140-148.
[5] Chen B, Wu Z and N (2012)Experimental research on properties of high - strength foamed concrete.
[6] journal of materials in civil engineering 24(1):113-118.
[7] Debied F and kenai s (2008) the use of the concrete and fine crushed bricks as RC Mr carthy MY and material and structure 33(1):38-42.
[8] Dhir RK, Mccarthy MJ and Tittle use of condition PDF as a fine aggregate component in concrete the 229(5):886-893.
[9] El - din B , Hegazy E fouad HA and Hassanain AM (2012) brick manufacturing from water treatment in sludge and rice husk Australian journal of basic and applied sciences 6(3):453-461.
[10] Hansen TC (1992) recycling of demolished concrete and masonry CRC press boca rato, FL,USA.
[11] Hapazari i, Ntuli V and Taele B (2015) waste generation and management in Lesotho and to clay brick
[12] Recycling a review , British Journal of applied science and technology 8(2): 148-161.
[13] ji R, Zhang ZT ,LIu LL and wang XD (2014) development of the random simulation model forestimation
[14] The thermal conductivity of insulation materal building environment 80:221=227.