Enhancement of Bricks By Incorporation of Nanomaterial

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Abstract- *The most of the building material for construction of houses is the normal brick. The rapid growth in today's construction industry has obliged the civil engineers in searching for more efficient and durable alternatives far beyond the limitations of the conventional brick production. Although the use of fly ash has many advantages, its low hydration at early stage causes the strength to be low. In this study, the experimental investigation was carried out to find the optimum mix percentage of flyash brick. This paper presents the experimental investigation of Fly Ash Bricks using nanoclay as a replacement material. The nanoclay is used in the bricks with 10% and 20% mixes respectively. However the brick specimen of size 230mm x 110mm x 90mm were casted. The specimen was casted and compressive strength test was carried out. To find the material property, consistency test, fineness, hardness, soundness, efflorescence, water absorption tests were conducted.*

Keywords- Bricks, Flyash, Nanoclay, Optimum mix percent, Test.

I. INTRODUCTION

In the present scenario in the construction industry, use of economic and environmental friendly material is of a great concern. One of the main ingredients used is cement. It is observed from various studies that the heat emitted from cement accounts to a greater percentage in global warming. Cement industries account to a greater emission of CO2 and they also use high levels of energy resources in the production of cement. In order to minimize these effects, replacement of cement with some pozzolanic materials such as fly ash, can have an improving effect against these harmful factors. This project emphasizes the effect of nanomaterial on various properties of flyash brick. This experimentation have been carried out for evaluating the various properties of flyash brick by the usage of nanomaterial.The results have shown the importance of nanoclays in compressive strength. The results have shown good performance of nanomaterial used flyash brick.

II. MATERIALS COLLECTED

1. Cement :

Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produces concrete. Cement is the most widely used material in existence and is only behind water as the planet's most-consumed resource

2. Flyash :

Fly ash is a fine powder that is a byproduct of burning pulverized coal in electric generation power plants. Fly ash is a pozzolan, a substance containing aluminous and siliceous material that forms cement in the presence of water. When mixed with lime and water, fly ash forms a compound similar to Portland cement. This makes fly ash suitable as a prime material in blended cement, mosaic tiles, and hollow blocks, among other building materials. When used in concrete mixes, fly ash improves the strength and segregation of the concrete and makes it easier to pump.

3. Nanomaterial :

Nanomaterials are chemical substances or materials that are manufactured and used at a very small scale. Nanomaterials are developed to exhibit novel characteristics compared to the same material without nanoscale features, such as increased strength, chemical reactivity or conductivity.

PROCESSING OF NANOCLAY:


FIG 1.SITE SELECTION


FIG 2.CLAY COLLECTIO


FIG 3.OVEN DRYING


FIG 4.GRINDING


FIG 5.SIEVEING


FIG 6.FINAL PRODUCT

III. TEST CONDUCTED

LABORATORY TEST ON MATERIALS:
- Specific gravity of cement
- Specific gravity of fly ash
- Consistency of cement
- Consistency of fly ash
- Fineness of cement
- Fineness of fly ash.

TEST ON FLYASH BRICKS:
1. Hardness test.
2. Soundness test.
3. Efflorscence.
4. Impact test.
5. Water absorption.
6. Compression test.

TABLE 1.SPECIFIC GRAVITY OF CEMENT:

PARTICULARS	WEIGHT(Kg)
Weight of the density bottle (w1)	0.024
Weight of the density bottle + sample (W2)	0.072
Weight of the density bottle + sample + water (W3)	0.098
Weight of the density bottle + water (W4)	0.093

Specific gravity = W2 – W1 / (W2 – W1) – (W3 – W4) = 2.90

TABLE 2. SPECIFIC GRAVITY OF FLYASH:

PARTICULARS	WEIGHT(Kg)
Weight of the density bottle (w1)	0.024
Weight of the density bottle + sample (W2)	0.042
Weight of the density bottle + sample + water (W3)	0.072
Weight of the density bottle + water (W4)	0.064

Specific gravity = W2 – W1 / (W2 – W1) – (W3 – W4) = 2.10

TABLE 3. CONSISTENCY OF CEMENT:

Weight of cement taken(a)	Weight of water taken(b)	Plunger penetration (mm)	Consistency of cement (%) by weight b/a *100
300gm	93ml	6	31%

Consistency = b/a*100 = 31%
Consistency of cement is found to be 31%

TABLE 4. CONSISTENCY OF FLYASH:

Weight of flyash taken(a)	Weight of water taken(b)	Plunger penetration (mm)	Consistency of flyash(%) by weight b/a *100
300gm	168ml	3	56%

Consistency = b/a*100 = 56%
Consistency of cement is found to be 56%

TABLE 5. FINENESS OF CEMENT:

Weight of sample taken(W1)	weight of residue(W2)	Fineness (%)
100g	6g	6%

% of cement retained = W2/W1*100
Fineness of cement is found to be 6%

TABLE 6.FINENESS OF FLYASH:

Weight of sample taken(W1)	weight of residue(W2)	Fineness (%)
100g	28g	28%

% of cement retained = W2/W1*100
Fineness of cement is found to be 28%

IV. INTERPRETATION OF RESULTS

NORMAL FLYASH BRICK:
1.SPECIFIC GRAVITY:
Specific gravity of cement = 2.90
Specific gravity of flyash = 2.10
2.CONSISTENCY TEST:
Consistency of cement = 31%
Consistency of flyash = 56%
3.FINENESS TEST:
Fineness of cement = 6%
Fineness of flyash = 28%
4.HARDNESS TEST = Good
5.SOUNDNESS TEST = Good
6.EFFLORESCENCE TEST = Light
7.WATER ABSORPTION TEST = 12%
8.COMPRESSIVE STRENGTH = 5.45MPa

NANOCLAY USED BRICK:
1.SPECIFIC GRAVITY :
Specific gravity of cement = 2.90
Specific gravity of flyash = 2.10
2.CONSISTENCY TEST:
Consistency of cement = 32%
Consistency of flyash = 58%
3.FINENESS TEST:
Fineness of cement = 8%
Fineness of flyash = 29%

TABLE 7 .MIX RATIOS:

REPLACEMENT OF FLYASH BRICKS:	MIX RATIO - 1	MIX RATIO - 2
FLYASH	50%	50%
CEMENT	40%	30%
NANOCLAY	10%	20%

V. FINAL RESULTS

TESTS	RATIO - 1	RATIO - 2
HARDNESS	Good	Good
SOUNDNESS	Good	Good
EFFLORESCENCE	Ligh:	Light
WATER ABSORPTION	11%	11%
COMPRESSIVE STRENGTH	5.50MPa	5.75MPa

VI. CONCLUSION

Based on the experimental study, following conclusions can be drawn regarding the strength behavior of flyash brick. The study was conducted to find the optimum mix percentage of flyash brick. However the brick specimen of size 225mm x 100mm x 90mm was cast for different mix percentage of Flyash. However the specimens have been tested for two mix proportions. The mechanical properties such as compressive strength were studied for different mix

proportions. As a result by comparing the results of normal flyash brick and nanomaterial used flyash brick, the compressive strength is achieved more than usual flyash brick and alternatively other test results have shown the impact of using nanoclay in the brick. The only drawback is, it weights more. Flyash does not modify the hydric properties of the bricks but it does make them lighter.

In fact, all the bricks with fly ash have a lower density. Flyash bricks show less damage than conventional bricks when exposed to salt crystallization cycles. Thisimprovement is due to the reduction of the surface area of the bricks. The results have shown the importance of nanoclays in compressive strength. The results have shown good performance.

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