Characteristic Strength Study of Fly-ash Cement Bricks by using Ironite

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Abstract- *Fly-ash brick made with cement, sand & fly ash. In the study, in the experimental investigation a small quantity of ironite added as 0%, 2%, 4%, 6%, 8%, and 10% at different proportion of cement, sand and fly ash. From the above proportion result shows the variation of compressive strength for different added percentage of ironite. Obtains compressive strength from the IS3495:1992 (part-1). The maximum compressive strength is obtained from (1:1:3.5) at 8% of ironite.*

Keywords- Cement, sand, fly-ash, ironite, Compressive strength, Water absorption test

I. INTRODUCTION

Fly ash brick are economic and environmental friendly, the main ingredient of fly ash brick is cement ,sand and fly ash .Fly-ash is a byproduct of many thermal power stations and other plants using pulverized coal or lignite as a source of heat for boilers. On burning nearly 30% of coal is converted into fly ash 75% of which is fine fly ash and rest is coarse bottom ash .The fly ash flies through the chimney and its discharge through the chimney can be minimized by installing and proper working of fabric filters mechanical and dust collectors and electro precipitators. Fly-ash resembles a pozzolona i.e. a substance which through not cementations itself continuous constituents which combine with the lime to form a material having cementing properties. The fly ash contains unborn carbon. It is acidic in nature and its main constituents are silica, aluminum oxide and ferrous oxide. Now a day's fly-ash brick are extensively used in all building constructional activities similar to that of common burnt clay bricks. The fly ash bricks are comparatively lighter in weight and stronger than common clay bricks. Ironite is usually applied to concrete floors intended to carry heavy rolling loads, which often withstands bearing two to five times greater than the ordinary concrete floors. Due to compression and impact load on the surface, crushing action takes place .This result in to heavy dusting and subsequently potholes in the concrete floors, which are great implement sin the smooth and normal function of a factory. The high compressive strength of ironite Powder topping provides the necessary slip resistance when moisture & oils comes in contact with the floor ironite powder topping is a must to protect employees working under wet conditions, for surefooted safety.

II. MATERIALS AND BLOCK DIMENSIONS

1. Cement

OPC-53 grade cement is used in mixture having specific gravity 3.17 and confirming to IS-12269:1987.

2. Sand:

The project work is restricted to morum sand collected from the storage. The sand was collected to ensure that there was no allowance for deleterious materials contained in the sand. Stone dust from crushers/quarry stone dust has coarse sand properties; clean & coarse dust has been used about 44.5 to 67.5% by weight. It fulfills the requirement of IS 383:1970.

3. Fly-Ash

Fly ash, the by-product from thermal power plants, is used which is confirming to IS-3812(PART-1).Fly ash collected from the NTPC-UCHAHAR.

4. Ironite

Ironite is a metallic aggregate – tough ductile specially processed and sized graded particle of iron, combined with chemical dispersing agent which enables the metallic hardener to move more easily into the surface. Ironite taken from the iron ore. it was used in flooring so that it can withstand heavy vehicles.

5. Composition Of Ironite

Iron-95.776%
Corban-4.24%

III. EXPERIMENTAL PROGRAM

(i) Each sample is prepared for about 15 kg. For which according to proportion, required amount of Fly-ash,

Cement, Sand and ironite is weighted and water quantity (17%) of weight of sample as 2.5 Lt. Are used.

(ii) Quantity of water may get change because it is slightly depends on moisture content of fly-ash and sand.

(iii) Firstly according to the proportion, required amount of cement and sand fed into pan and mixed properly till well mixed thoroughly by hand.

(iv) Then required amount of Fly Ash and ironite is added and again mixed for greater period and water is poured during this mixing and grinding ensure mixer is properly prepare for half slurry completely. Check wetness of slurry.

(v) Slurry is conveyed into a mould of 230×110×70 mm and pressed a highly mechanical system loading about 3000 kg.

(vi) The samples were taken out of mould striping lift instantly and conveyed by trolley at the curing/storing place.

(vii) The samples are then cured after 2-3 days air dried for 21 days.

(viii) After curing 21 days it air dries for 10-15 days, and then use for construction work.

Fig- Molding of brick

IV. RESULT

A. Compressive Strength

The compressive strength of any individual brick tested shall not fall below the minimum compressive strength specified for the corresponding class of brick. The lot shall be then checked for next lower class of brick. The test is carried out as per IS-3495, Part-1, 1992. The frog of the brick is filled with 1:3 mortars and the specimen is stored shaded place under normal moister for 24 hours, and then immersed in water for 24 hours. The specimen is placed in compression testing machine with 10 mm wooden plate on top and bottom of it to get uniform load on the specimen. Then load is applied axially at a uniform rate of 15 N/mm2. The crushing load is noted, strength is the ratio of crushing load to the area of brick loaded.

Compressive strength = crushing load in N/ area of specimen brick i.e. 230 x 110mm x 70mm)

Compressive strength result

Ratio	Ironite	Compressive strength (MPA)
1:1:3.5	0%	13.34
	2%	14.50
	4%	15.65
	6%	16.60
	8%	16.95
	10%	16.5
1:1:4	0%	12.81
	2%	14.30
	4%	15.42
	6%	16.15
	8%	16.00
	10%	15.60
1:1:4.5	0%	12
	2%	12.55
	4%	12.88

	6%	13.57
	8%	13.00
	10%	12.75

COMPRESSIVE STRENGTH GRAPH

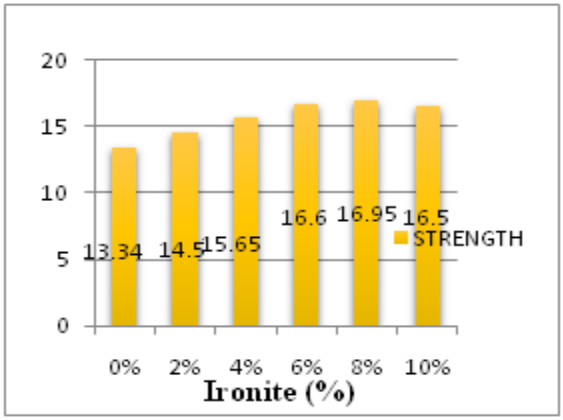

Fig No-1 Graph showing plot between compressive strength and Ironite (%) for ratio 1:1:3.5

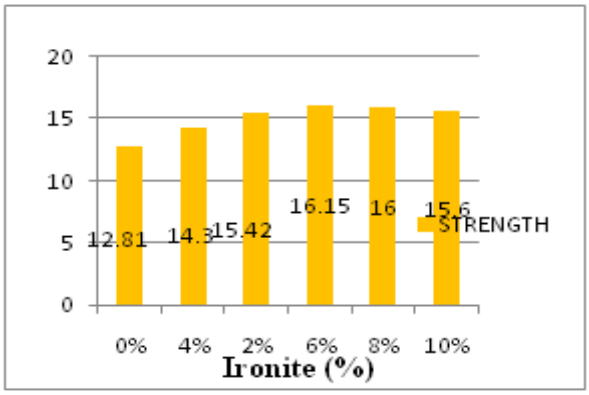

Fig No-2 Graph showing plot between compressive strength and Ironite (%) for ratio 1:1:4

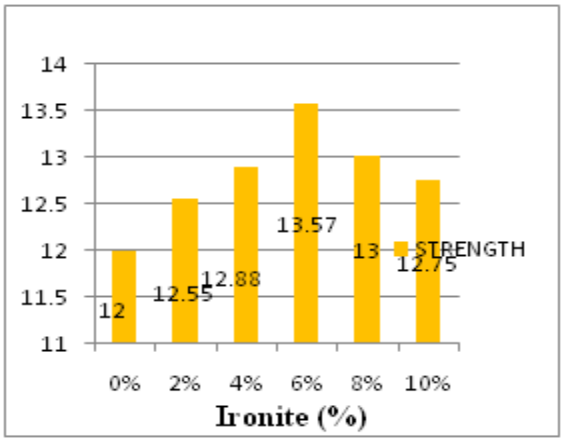

Fig No-3 Graph showing plot between compressive strength and Ironite (%) for ratio 1:1:4.5

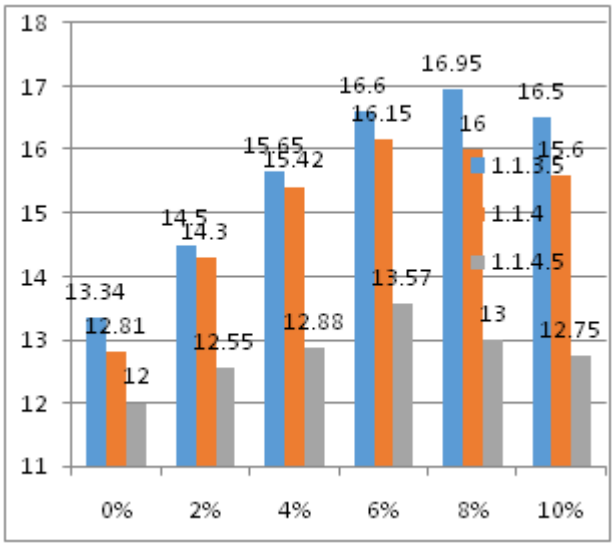

Fig No-4 Comparative compressive strength for different ratio

V. WATER ABSORPTION TEST

PROCEDURE-

(i) After 21 days curing and drying under the shed for 5 days, samples are weighted i.e."B" then immersed in water at room temperature for 24 hour.

(ii) Specimens shall be weighted after removal from water tank and cleaning the surface of specimen using damp cloth.

(iii) Again specimen is weighted i.e."A".Now using the formula,

$$\textit{Water absorption}\ (\%) = \frac{\mathbf{A-B}}{\mathbf{B}} \times \mathbf{100}$$

Where,

A = Wet mass of unit, in kg

B = Dry mass of unit, in kg

Water absorption result

Ratio	**Ironite**	**Water absorption**
1:1:3.5	0%	14.1
	2%	13.5
	4%	12.5
	6%	12
	8%	11.9
	10%	12.45
1:1:4	0%	14.35
	2%	13.7
	4%	13.01
	6%	12.9
	8%	13.20
	10%	13.80
1:1:4.5	0%	15.76
	2%	14.5

	4%	14.2
	6%	13.8
	8%	14.40
	10%	15.00

WATER ABSORPTION TEST GRAPH

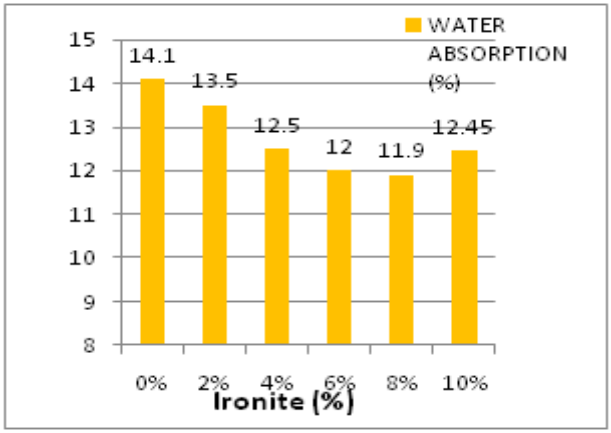

Fig No-5 Graph showing plot between water absorption and Ironite (%) for ratio 1:1:3.5

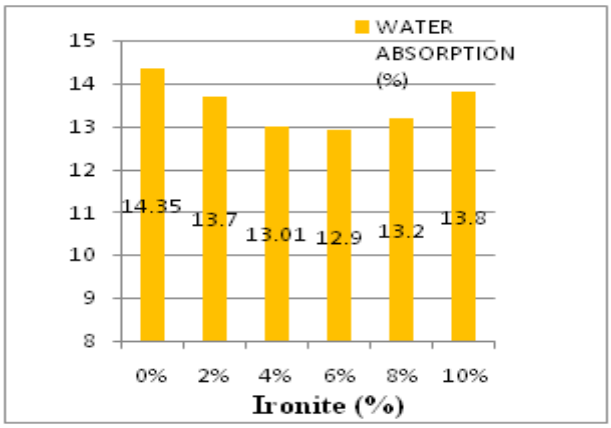

Fig No-6 Graph showing plot between water absorption and Ironite (%) for ratio 1:1:4

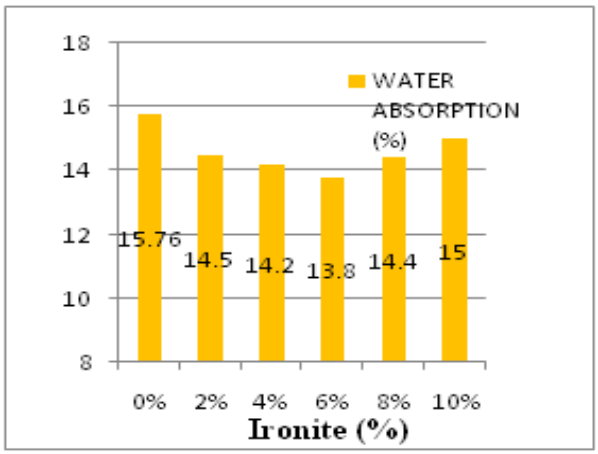

Fig No-7 Graph showing plot between water absorption and Ironite (%) for ratio 1:1:4.5

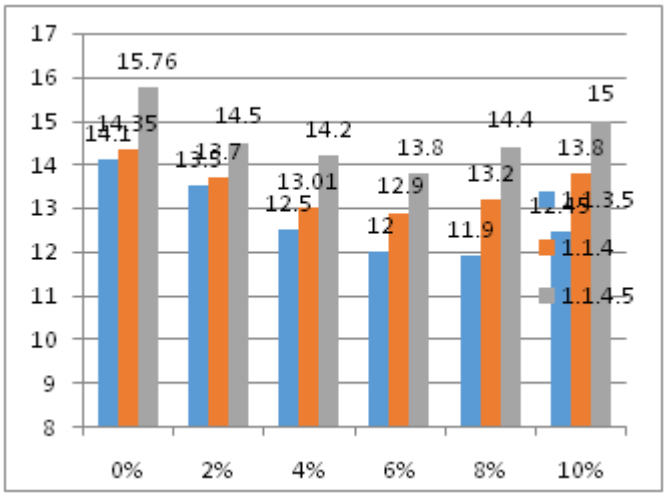

Fig No-5.8 Comparative water absorption for different ratio.

VI. DISCUSSION

- On the basis of compressive strength. It is notice that on increasing the ratio, the strength decreases.
- By increasing ironite percentage (0%,2%,4%,6%) for particular ratio, it is found that strength slightly increases .
- By increasing fly ash in the ratio compressive strength decrees.

Advantages

1) Machine finished these are uniform in size and shape.
2) By consuming 80-82% fly ash, the cause of environmental pollution and hazards due to disposal is minimized
3) Saving in fuel.
4) Can be used as facing bricks without any external plastering.

Cost analysis

	CEMENT	SAND	FLY ASH	IRONITE
RATE	RS.260 PER 50 KG BAG	RS.450 PER CUM	RS.100 PER CUM	RS.17.5 PER KG

Ratio	Ironite	Total cost	Rate per brick
1:1:3.5	0%	17.5	3.5

	2%	21	4.2
	4%	26	5.2
	6%	30.95	6.19
	8%	35.95	7.19
	10%	40.8	8.16
1:1:4	0%	15	3.00
	2%	19.95	3.99
	4%	24.9	4.98
	6%	30.8	6.16
	8%	34.8	6.96
	10%	39.75	7.95
1:1:4.5	0%	13.95	2.79
	2%	18.95	3.63
	4%	23.9	4.62
	6%	28.9	5.62
	8%	33.85	6.77
	10%	38.8	7.76

VII. CONCLUSION

The different percentage of ironite used in fly-ash cement brick shows the variation of strength as well as cost.

The paper concluded following parameters

- The ratio 1:1:3.5 have the maximum compressive strength while the ratio 1:1:4.5 have the minimum strength.
- Ratio 1:1:4.5 also having strength similar to the first class brick with suitable cost.

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