

# COMPRESSIVE STRENGTH STUDIES OF THE FLY ASH BRICK USING DIFFERENT COMPOSITIONS

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## Abstract:

The bricks are manufactured from natural clay, which is obtained from agricultural land. Excess usage of agricultural land for this clay results in loss of good fertile quality of soil and diversion of agricultural land for brick manufacturing. The modified Fly Ash bricks are an alternative for the conventional bricks which can be used effectively to replace the conventional bricks. In this research study, different amount of fly ash has been used in the three different mix to make fly ash bricks. In this mix the quantity of fly ash replace with the dust, Amount of fly ash is increases and the quantity of dust is decreases in the mix of fly ash brick. Quantity of lime is added in the fly ash brick of different percentages of 5%, 10% and 15%.. The maximum compressive strength of the brick is observed 7.95 N/mm<sup>2</sup> at 40% fly ash, 15% lime and 35% dust. If the amount of lime percentages increases and amount of dust becomes decreases, compressive strength results of fly ash brick shows best results at 40% fly ash. Minimum compressive strength has been shown in the mix of 20% fly ash because the amount of dust is more as compared to fly ash. Compressive strength is also increases at 60% fly ash, 15% dust and 15% lime which amount to be 3.80 N/mm<sup>2</sup>.The optimum compressive strength is getting at 40% addition of fly ash.

**Keywords:** Lime, Dust, Fly ash, Compressive Strength, Brick

## I. INTRODUCTION

In the construction industries, bricks are widely used construction material, as it may be used for the outer portion or the inner portion i.e. for the partition of a building. Making of brick is more important technological processing sector to use a solid waste just because of that the construction industry uses a large quantity of raw materials. For the assembling of a green structures, it winds up basic to use squander material so that the procedure of development must be eco-accommodating. For an exorbitantly extensive amount of generation alongside the use of these sort blocks by utilizing waste materials, further examination and enhancement is fundamental as per the specialized perspectives, temperate angles and ecological viewpoints..

Fly fiery remains nearly takes after with volcanic slag utilized underway of the most punctual known water powered concretes around 2,300 years back. Those concretes were made close to the little Italian town of Pozzuoli - which later gave its name to the expression "pozzolan.". A pozzolan is a siliceous or siliceous/aluminous material that, when blended with lime and water, frames a cementitious compound. These blocks are reasonable for use in stone work development simply like regular consumed earth blocks. Creation of pummeled fuel fiery remains lime blocks has just begun in the nation and it is normal that this standard would empower generation and use on mass scale. This stand sets out the basic necessities of pounded fuel fiery remains blocks in order to accomplish consistency in the produce of such blocks. Then again, measurements demonstrate that a critical factor for the prosperity of the occupants is the decision of building materials. "Unhealthy,, materials We invest the vast majority of our energy inside and building materials impact the "wellbeing" and security of the indoor condition..

There are two sorts of common sources: limited and sustainable. Sustainable assets are boundless and they can be normally supplanted with the progression of time (e.g. wood). In any case, just the quickly inexhaustible assets are viewed as manageable, i.e. materials that have a gather cycle of 10 years or less (e.g. bamboo, straw, cork, wool, linoleum, poplar OSB, etc.).

### 1.1 Composition of Fly ash brick

The main composition of the materials to make the fly ash bricks are:

- Fly Ash
- Lime
- POP
- Cement

- Dust

## II. COMPOSITION OF NORMAL CLAY BRICKS AND FLY ASH BRICKS

Fly Ash Bricks	Normal Clay Bricks
A) Fly ash- 60-65%	Silica (sand) – 50% to 60%
Sand/Stone dust- 20-25%	Alumina (clay) – 20% to 30%
Hydrated lime- 8-12%	Lime – 2 to 5%
Gypsum-5%	Iron oxide – 7%
B) Fly ash- 50% to 60%	Magnesia – less than 1%
Sand/stone dust – 32%-40%	
Cement – 8-10%	

## III. MANUFACTURING MACHINE OF FLY ASH BRICK

- Mixing Barrel
- Brick Mould
- Pressure Applying Machine
- Wooden Planks
- Wooden Planks Lifter



Figure 3.1: Machine setup

## IV RESULT AND DISCUSSION OF THE FLY ASH BRICK

This is the control mix design of the fly ash brick which is using on the fly ash brick plant. Weighted the materials as per quantity and cast the brick as shown in Figure 4.4. In this mix the quantity of dust is more as comparison to other materials. The fly ash is also added more in the mix after the dust because the cost of these materials is very economical so the construction cost of the fly ash is also economical. The quantity of the dust is decreases in the mix as the quantity of lime increases with the differentiate of 5 %. The percentages and quantity of the fly ash, lime, Plaster of Paris (POP), Cement, and dust as shown in the following table. Load and compressive strength are as shown in Table 4.1 and graphical representation as shown in Figure 4.1. If the dust decreases in the mix with the addition of lime, so the compressive strength of fly ash brick becomes increase because dust has no pozzolona properties. Lime is the type of material which has less embodied energy than cement. Free lime absorbs carbon dioxide in the setting process of carbonation. Gentle binding properties of lime enable full re-use of other materials. The maximum compressive strength has been observed at 20 % fly ash and 55 % dust which is 1.34 N/mm<sup>2</sup> and greater than all other mixes.

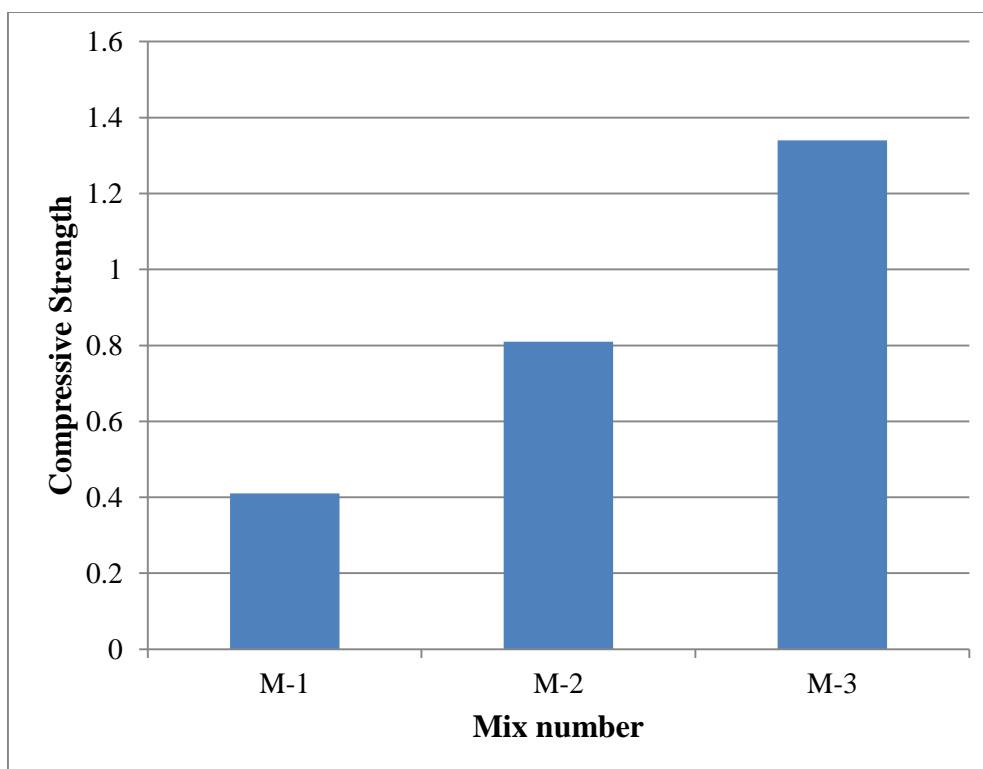


Figure 4.1: Graphical representation of the compressive strength at 20% fly ash

Table 4.1: Compressive strength results at 20% fly ash

Quantities of Material by Percentages & Weight for Total Quantity (4KG)							
Mix no	Fly Ash	Lime	POP	Cement	Dust	Load (KN)	Com. Strength (N/mm <sup>2</sup> )
M-1	20 (%) 800gm	5 (%) 200gm	5 (%) 200gm	5 (%) 200gm	65 (%) 2600gm	7	0.41
M-2	20 (%) 800gm	10(%) 400 gm	5 (%) 200gm	5 (%) 200gm	60 (%) 2400	14	0.81
M-3	20 (%) 800gm	15 (%) 600 gm	5 (%) 200gm	5 (%) 200gm	55 (%) 2200 gm	23	1.34

In this mix the quantity of fly ash replace with the dust, more addition of fly ash and lime also in the brick mix and quantity of dust is less with the addition of percentage as 45%, 40% and 35%. The amount of lime was added in the mix of 5%, 10 % and 15% in the mix. The percentages and quantity of the fly ash, lime, Plaster of Paris (POP), Cement, and dust as shown in the following table. Load and compressive strength are as shown in Table 4.2 and graphical representation as shown in Figure 4.2. The maximum compressive strength is achieved at 35% dust and 15% lime which amount to be 7.95 N/mm<sup>2</sup>. The compressive strength of the brick is going to increase with the addition of lime and reduced the percentage addition of dust because the fly ash and lime has pozzolonic properties and enhance the strength of fly ash brick.

Table 4.2: Compressive strength results at 40% fly ash

Quantities of Material by Percentages & Weight for Total Quantity (4KG)							
Mix no.	Fly Ash	Lime	POP	Cement	Dust	Load (KN)	Com. Strength (N/mm <sup>2</sup> )
M-4	40 (%) 1600gm	5 (%) 200gm	5 (%) 200gm	5 (%) 200gm	45 (%) 1800gm	95	5.55

<b>M-5</b>	40 (%) 1600gm	10 (%) 400 gm	5 (%) 200gm	5 (%) 200gm	40 (%) 1600	110	<b>6.43</b>
<b>M-6</b>	40 (%) 1600gm	15 (%) 600 gm	5 (%) 200gm	5 (%) 200gm	35 (%) 1400 gm	136	<b>7.95</b>

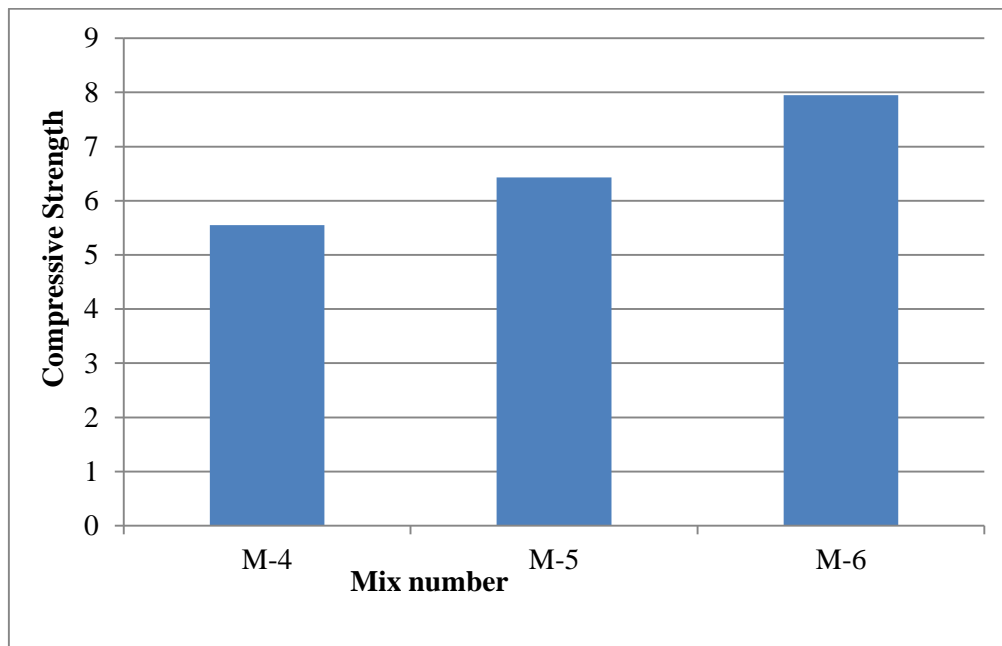


Figure 4.2: Graphical representation of the compressive strength at 40% fly ash

The results of load and compressive strength are as shown in Table 4.3 and graphical representation as shown in Figure 4.3. In this mix the quantity of fly ash replace with the dust, more addition of fly ash (60%) in the brick mix and quantity of dust is less with the addition of percentage as 25%, 20% and 15%. The amount of lime is also increases in the mix as different percentage of 5%, 10% and 15%. The percentages and quantity of the fly ash, lime, Plaster of Paris (POP), Cement, and dust as shown in the following table. The maximum compressive strength is achieved at 15% lime and 15% dust which is 3.80 N/mm<sup>2</sup>. The compressive strength of the brick is going to decrease with the addition of lime, fly ash & dust because quantity of the fly ash is more in the mix but as per the dust quantity is decreasing the compressive strength is going to increase. Dust is not a good role play for the strength of the fly ash brick.

Table 4.3: Compressive strength results at 60% fly ash

Quantities of Material by Percentages & Weight for Total Quantity (4KG)							
Mix no.	Fly Ash	Lime	POP	Cement	Dust	Load (KN)	Com. Strength (N/mm <sup>2</sup> )
<b>M-7</b>	60 (%) 2400gm	5 (%) 200gm	5 (%) 200gm	5 (%) 200gm	25 (%) 1000gm	28	<b>1.63</b>
<b>M-8</b>	60 (%) 2400gm	10(%) 400 gm	5 (%) 200gm	5 (%) 200gm	20 (%) 800 gm	54	<b>3.15</b>
<b>M-9</b>	60 (%) 2400gm	15 (%) 600 gm	5 (%) 200gm	5 (%) 200gm	15 (%) 600 gm	65	<b>3.80</b>

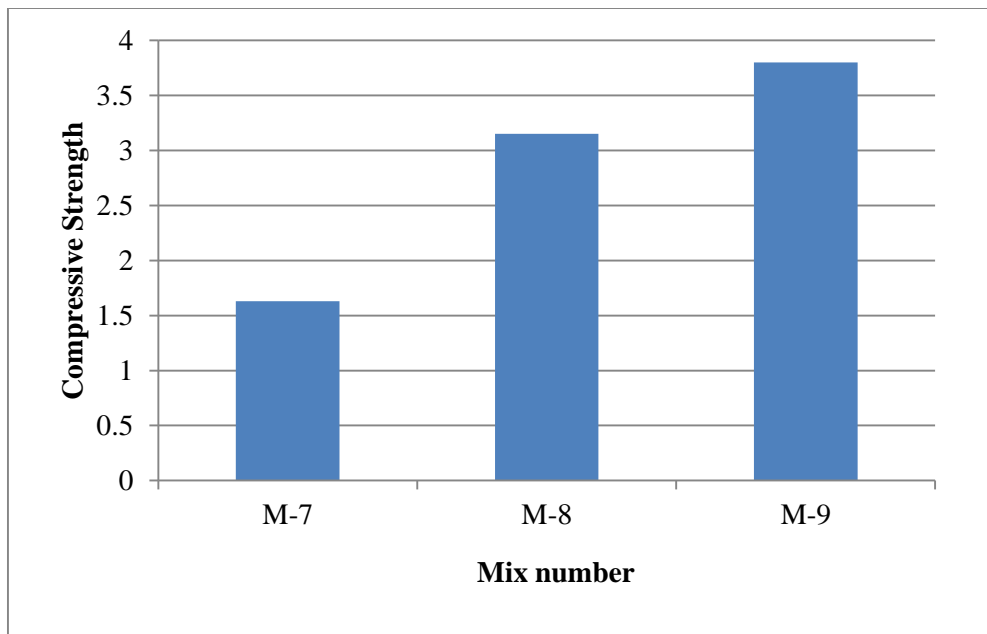


Figure 4.3: Graphical representation of the compressive strength at 60% fly ash



Figure 4.4: Casting of the bricks

## V. CONCLUSION

In this study fly-ash, cement, lime, POP and dust has been used to prepare the fly ash brick. Followings are the conclusion of the study:

- The compressive strength results of the normal mix at 20% fly ash is become decrease because the amount of dust is more in the mix.
- The compressive strength shows maximum results at 40% fly ash, 15% lime and 35% dust which amount to be 7.95 N/mm<sup>2</sup> and greater than other fly ash brick mix.

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