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# Analysis of Aerated Concrete [AAC] Block and it's Masonry

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**ABSTRACT:** The most frequent building materials used in the construction and building sectors are traditional bricks. Autoclaved aerated concrete blocks are one of the most recently utilised building materials. AAC is a light-weight building-construction compound made of lime, cement, sand, aluminium powder and fly ash, that is used worldwide. AAC is currently widely regarded as a leading-edge, high-performance construction material. AAC Block, an environmentally friendly material, offers a promising building construction solution. As a result of the reduced structural load of the wall at the beam, due to the use of AAC Block decreases construction costs by up to 20%. The usage of AAC Blocks also reduces material requirements by up to 50%. This research completed a thorough investigation into the mechanical properties

**KEYWORDS:** AAC, Light-weight, cast Reduction, High strength

## I. INTRODUCTION

Blocks are projected to continue to be the most widely utilised construction material in the country [1-2]. Block making is a traditional Indian industry that is mostly concentrated in rural areas [3-4]. It has directly or indirectly resulted in the progression of natural and medical disorders [5-6]. Natural contamination from block making tasks is harmful to human health, wildlife, and vegetation in the vicinity of a block furnace [7-8]. The uniqueness of global temperature change and environmental change is exacerbated by pollutants caused by brickmaking tasks [9]. Due to ice damage, extreme weather conditions can cause the block surface to erode [10]. To avoid environmental contamination and global warming, different types of blocks might be used instead of red blocks [11-13]. Concrete blocks were used to circulate air (AC).

## II. MATERIAL INTRODUCTION

### A. Ordinary Portland Cement (OPC)

When no sulphates are present in the soil or groundwater, ordinary Portland Cement (OPC) is the most common concrete used for large-scale construction [14-15]. Concrete can be defined as a firm and glue-like holding medium. Based on the cement strength at 28 days, the OPC was divided into three grades: 33, 43, and 53 [16].

### B. Fly Ash

Fly debris is a substance that is almost identical to volcanic debris and is the most common of the coal product igniting process [17-18]. The ignition temperature of coal in today's electric power plants is over 2800 degrees Fahrenheit. Non-flammable minerals that are produced when coal structure base debris and fly debris are consumed. The material which is carried away with the exhaust gases is called fly debris, and it is gathered and stored in storehouses for testing and gainful use [19-20]. There are different types of fly detritus. Consumption of anthracite or bituminous coal produces Class F fly debris on a regular basis. In general, it has less than 6% CaO. Class D fly debris is delivered on a regular basis by consuming lignite or coal [21].

### C. Lime

Lime is a calcium-based inorganic substance with a high concentration of carbonates, oxides, and hydroxides. It's also the name of a common mineral (local lime) CaO, which appears in volcanic eruptions as a result of coal crease fires and in altered limestone xenoliths [22]. "Lime" gives a feeling of staying or sticking to it, as it was first used as a building mortar. These materials are still widely used in construction and design [23]. The rock and minerals that are derived from it, such as chalk, are primarily composed of calcium carbonate composed. "Consuming" transforms into the extremely abrasive substance "quick lime" [24].

### D. Water

Cement contains a substantial amount of water. It reacts synthetically with concrete to produce cement's optimal qualities [25]. The amount of water that interacts with concrete, effects concrete downturn, and used to find the water to



cementitious proportion of the significant mixture is referred to as blending water [26]. Concrete's w/c controls its strength and solidity to a greater extent. The quality of the blending water used in concrete has a considerable impact on new significant features such as setting time and functioning, as well as the strength and hardness of solidified concrete [27].

*E. Quarry Dust*

Quarry dust is a by-product of the crushing process used in quarrying. Quarry dust has been used in a variety of construction projects, including street construction and the creation of building materials that is lightweight totals, blocks, tiles, and AAC blocks [28]. The effects of partly replacing sand and quarry dust on the characteristics of newly mixed and solidified concrete applications have also been the focus of research [29].

*F. Saw Dust*

Sawdust using a saw or other instrument to cut, crush, bore, sand, or otherwise pound wood or other materials. It's made up of a lot of little wood pieces. Because of its flammability, it poses a threat to manufacturing enterprises [30].

*G. Plaster of Paris*

Mortar is the substance that is used as the defensive and boosting covering of divisions and roofs, as well as for decoration and projecting enhancing elements. In English, the term "mortar" refers to a material used to coat the insides of buildings [31]. The most well-known types of mortar mostly comprise gypsum, lime, or concrete, but they all function in the same way. Before being applied to the surface, the mortar is prepared from dry powder is added to water to form a firm but functional glue. The water response releases heat through crystallisation, and the hydrated mortar solidifies as a result [32].

*H. Sand*

Stands out because of its size, which is larger than rock yet coarser than residue. Sand organization varies depending on local stone sources and conditions, but on the mainland and in non-tropical areas, sand is organised in a similar way. coastal environments, silica, mainly in the form of quartz, is the most widely recognised constituent of sand [33].

*I. Aluminium Powder*

It is commonly used to provide autoclaved circulated air via concrete via a substance response that produces a gas in new mortar [5]. When 0.2 percent -0.5 percent aluminium is added to the blending fixings, the dry thickness of concrete is increased by 0.2 percent -0.5 percent. There are three types of aluminium powder: atomized, chip, and granules. The length, breadth, and thickness of an atomized molecule are all around the same request, with the length or width of a drop molecule possibly a few hundred times its thickness [10]. Aluminium powder is typically generated from foil scrap in the AAC industry and consists of microscopic piece formed aluminium [25].

**III. MATERIAL TESTING**

**A. CEMENT**

*1) Consistency of Cement:*

The amount of water necessary to make a standard-consistency cement paste is 25%.

TABLE I. CONSISTENCY OF CEMENT

Serial. No	Wt. Of cement (gm)	Water added		Penetrated ht. "mm" (from bottom)
		%	Gm	
I	300	15	45	15
II	300	20	60	11
III	300	25	75	7

*2) Cement Specific Gravity Determination:*

$$G_s = \frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)} \dots\dots\dots(1)$$



w1 – 593 g  
 w2 – 737 g  
 w3 – 1570cg  
 w4 – 1412cg  
 Gs = 3.17

**OUTCOME:** Cement Specific Gravity is **3.17**

3) *Dry Sieving for Cement Fineness Determination*

TABLE II. DRY SIEVING FOR CEMENT FINENESS DETERMINATION

Serial. No	Wt. Of Sample (gm)	Wt. of sample retained (gm)	Fineness %
I	200	16	8
II	200	8	4
III	200	12	6

**Calculation:**

$$Finess \% = \frac{Sample\ Wt.Retained\ on\ sieve \times 100}{Total\ Wt.of\ Sample} \dots\dots\dots(2)$$

**OUTCOME:** Cement fineness is **6 %**.

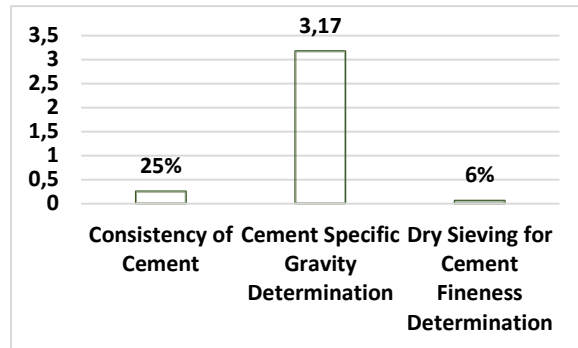


Fig. 1. Material Testing in Cement Outcome

**B. FLY ASH**

1) *Specific Gravity of fly ash*

**Calculation:**

$$Gs = \frac{W2-W1}{(W2-W1)-(w3-w4)} \dots\dots\dots(3)$$

w1 - 667.6 g  
 w2 - 727.6 g  
 w3 - 1321.4 g  
 w4 – 1289 g  
 Gs = 2.17

**OUTCOME:** Fly ash’s specific gravity is **2.17**



2) Sieve analysis to determine fly ash’s fineness

TABLE III. SIEVE ANALYSIS TO DETERMINE FLY ASH’S FINENESS

Serial. No	Sample Wt. (g)	Wt. of sample retained (gm)	Fineness %
I	200	12	12
II	200	8	8
III	200	6	6

Calculation:

$$Finess \% = \frac{Wt.of\ sample\ retained\ in\ sieve \times 100}{Wt.of\ Sample} \dots\dots\dots(4)$$

**OUTCOME:** Fly ash fineness **4.34%**

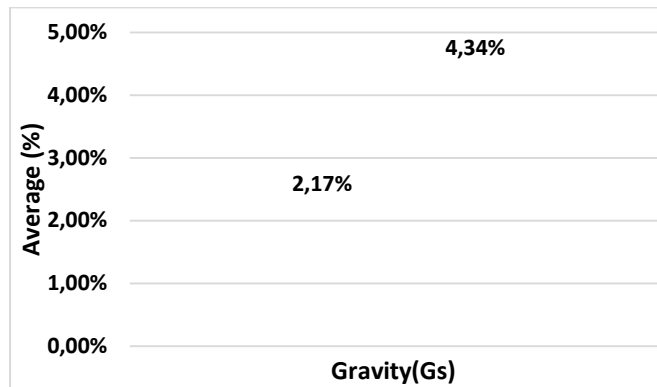


Fig. 2. Fly Ash Gravity and Fineness

C. LIME

1) Specific Gravity of Lime

Calculation:

$$Gs = \frac{W2-W1}{(W2-W1)-(w3-w4)} \dots\dots\dots(5)$$

- w1 - 681g
- w2 - 1385g
- w3 - 1961g
- w4 - 1534g
- Gs = 2.56

**OUTCOME:** Lime’s specific gravity is **2.56**

2) Lime’s Fineness Determination by Sieve analysis

$$Finess \% = \frac{Sample\ Wt.retained\ in\ sieve \times 100}{Total\ Sample\ Wt.} \dots\dots\dots(6)$$



TABLE IV. LIME’S FINENESS DETERMINATION BY SIEVE ANALYSIS

Sl. No	Wt. Of sample (gm)	Wt. Of sample retained (gm)	Fineness %
I	200	6	3
II	200	3	1.5
III	200	5	2.5

**OUTCOME:** As a result, lime’s fineness is **2.3%**

Items	Wt. Of block %	Wt. Of material (Kg)
Quarry dust	7.35	2.205
Water	0.64	4.9
Lime	21	6.2
Dust of saw	6.8	2.04
Cement	14	4.3
Aluminium powder	0.3	0.09
Fly ash	51	15.2

#### IV. RESULT AND DISCUSSION

##### A. Proportion Of Mixture 1

TABLE V. PROPORTION OF MIXTURE 1

Items	Wt. Of block %	Wt. Of material (kg)
Water	0.66	4.6
Aluminium powder	0.3	0.9
Lime	9.35	2.81
Sand	9.8	2.94
Cement	16	4.8
Fly ash	64	19.2

##### B. Proportion Of Mixture 2

###### 1) Cost Analysis

One hollow brick cost - **Rs 55. (Hollow clay block)**

The price of a single aerated block - **Rs 45**



TABLE VI. ITEMS VS UNIT COST

<i>Serial. No</i>	<i>Items</i>	<i>Unit</i>	<i>Total cost</i>
I	Cement	2.4 kg	15.84
II	Lime	1.496 kg	3.74
III	Fly as	10.4 kg	13
IV	Sand	1.568 kg	3.136
V	Aluminium Powder	0.032 kg	7.84
	<b>Total</b>	<b>15.896</b>	<b>43.556</b>

2) *Weight Comparison*

TABLE VII. TYPE OF BLOCK VS BLOCK WEIGHT (KG)

<i>Serial. No</i>	<i>Type of block</i>	<i>Block Weight (Kg)</i>
I	Hollow brick	24
II	Mix 1	16
III	Mix 2	18.63
IV	Mix 3	19

3) *Strength Comparison*

TABLE VIII. BLOCK TYPE VS BLOCK STRENGTH

<i>Serial. No.</i>	<i>Block type</i>	<i>block strength (N/mm<sup>2</sup>)</i>
I	Hollow brick	15
II	Mix 1	25
III	Mix 2	27.5
IV	Mix 3	31.25

4) *Estimation Of 2bhk Building (Old Material )*

TABLE IX. OLD MATERIAL 2BHK BUILDING ESTIMATION

<i>Sl. No</i>	<i>Items</i>	<i>Quantity</i>	<i>Rate</i>	<i>Amount (Rs)</i>
1	Earthwork	6.912 m <sup>3</sup>	206.25/m <sup>3</sup>	1425.6
2	PCC	1.152 m <sup>3</sup>	3975/m <sup>3</sup>	4579.2
3	Brickwork	27.414 m <sup>3</sup>	7500/m <sup>3</sup>	205605
4	Total RCC	20.4 m <sup>3</sup>	13276/m <sup>3</sup>	270830.4
5	Plaster Work	177.84 m <sup>2</sup>	280/m <sup>2</sup>	49795.2
6	Door	4 no	2500/unit	10000
7	Window	7 no	1000/unit	7000
8	Flooring Work	60.8 m <sup>2</sup>	2190/ m <sup>2</sup>	133152
			<b>Total</b>	<b>682387.4</b>

## 5) Estimation Of 2bhk (New Material)

TABLE X. NEW MATERIAL 2BHK BUILDING ESTIMATION

Sl. No	Items	Quantity	Rate	Amount (Rs)
1	Earthwork	6.912 m <sup>3</sup>	206.25/m <sup>3</sup>	1425.6
2	PCC	1.152 m <sup>3</sup>	3575/m <sup>3</sup>	4118.4
3	Total RCC Work	20.4 m <sup>3</sup>	12094/m <sup>3</sup>	248757.6
4	Plaster Work	177.84m <sup>2</sup>	280/ m <sup>2</sup>	49795.2
5	AAC block wall 0.2m	133.28m <sup>2</sup>	1342/ m <sup>2</sup>	178861.76
6	Flooring Work	60.8 m <sup>2</sup>	1100/m <sup>2</sup>	66880
7	Door	4 no	2200	8800
8	Window	7 no	1000	7000
			<b>Total</b>	<b>565638.56</b>

## V. CONCLUSION

Test results show that AC is both stronger and lighter than an empty block. The AC block can be used in this way instead of empty and normal blocks. AC blocks can be used for greater protection and are used to make pre-assembled constructions since they are light weight and can be cut with a saw, edged, and penetrated without difficulty. This article concludes that in restricted scope enterprises, AC blocks can be delivered at a lower cost and with less weight than in large scope enterprises.

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