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Performance of Aerated Concrete Blocks Under Varying Temperatures

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ABSTRACT: Aerated concrete blocks (AC) are widely used as masonry in building construction because of their light weight and low density**.** Try to determine the strength, bonding, cracking and thermal behavior of aerated concrete blocks at different temperatures, mortar ratios and thickness. The results show that at temperatures above 100°C, the strength will decrease and cracks will appear, and the bonding behavior will vary with the thickness and proportion of the mortar. Compared with the solid concrete block model, Thermal Comfort Research shows better thermal comfort.

1 INTRODUCTION:

Aerated concrete block (AC) is considered a low energy consumption, non-toxic and very sustainable building material with good thermal properties. The main purpose of the experiment plan is to study various technical characteristics of AC blocks, such as compressive strength, density, and thermal behavior.

2 Materials

The materials used in this study are detailed in the table below:

2.1 CEMENT

In this study, the 53-type ordinary Portland cement and its properties according to IS 12269: (1987) are listed in Table 1

Table-1 PROPERTIES OF CEMENT

S NO	PROPERTY	EXPERIMENTAL RESULTS	REQUIRMENTS AS PER CODE IS: 1229-1987
1	Fineness	2430cm2/kg	225m^2/kg
2	Specific gravity	3.20%	3.10%-3.25%
3	Initial setting time(minutes)	22 minutes	30 minutes
4	Final setting time(minutes)	540 minutes	600 minutes
5	Compressive strength	50N/mm^2	Not less than 53N/mm^2

2.2 FLY ASH

In this experimental study, Class F fly ash collected from near the RMC facility was used. The properties of fly ash are shown in Table 2.

Table-2 PROPERTIES OF FLY ASH

S NO	PROPERTIRS VALUES	VALUES
1	Specific gravity	2.10
2	Fineness	280
3	Bulk density(kg/m^2)	1100-1200
4	Visible colour	Grey

2.3 LIMESTONE POWDER

The lime powder required for AC production is obtained by grinding limestone into fine powder in AC processing facilities or simply buying it in powder form. Lime powder is stored in a warehouse made of mild steel (MS) or made of stone and concrete depending on the slope

3 METHODOLOGY

In this experimental study, the mix ratio of Aerated Concrete is determined by the appropriate mix ratio calculation method according to the previous literature. After the mixing plan is completed, create a sample mix to check whether the target density is reached. If the target density is not reached, change the water-cement ratio and determine the mixing ratio. Then cast cubes with and without substitutes according to the required density. Record the weight of the mold before and after casting. In this way, the target density that has been reached or not is checked. After the hardening is complete, put the cube into the hardening tank and check the target density of the foam concrete. When the cube reaches the target density, the compressive strength is performed.

4 EXPERIMENTAL INVESTIGATION

In this experimental investigation, we discuss about performance aerated concrete partial replacement of sand with lime stone powder.

4.1 CASTING AND DEMOULDING

Weigh all materials in the electronic measuring equipment. Clean the first mold and apply oil to the inner surface of the block. Then fill the mold with the aligned material at this time without compaction. Then, at this point after 24 hours, remove the square from the shape. Various mixtures are made by changing the mixing ratio. After 24 hours, the mold was taken out of and removed with water.

4.2 PROCEDURE

In order to understand the initial trend of temperature fluctuations of aerated concrete blocks, especially , the following research was conducted. Use the saw blade to cut the specimen from the whole block with the size of 600 × 200 × 150 to the size of 150 mm × 150 mm × 200 mm. Six specimens were cut in all, with three specimens being cut from these. Three of these samples were subjected to temperatures of 60°C, 1200°C, and 180°C for 60 minutes in the blocks. Each block was filled with hot air and brought to room temperature before being individually tested for bearing capability. At room temperature, test the load-bearing capability of the other three specimens by immersing them in water immediately after 1 hour of exposure to temperatures of 60°C, 120°C, and 180°C.

5 COMPRESSIVE STRENGTH

100mmX100mmX100mm cubes are used to prepare 7-day, 14-day and 28-day concrete cubes.

S NO	DENSITY OF AERATED CONCRETE(kg/m^3)	SPECIMEN	COMPRESSIVE STRENGTH(n/mm^2)		
			7 DAYS	14 DAYS	21 DAYS
1	800	1	0.8	1.8	3.2
		2	1.0	2.0	3.4
		3	1.0	2.0	3.4
		AVERAGE	0.93	1.93	3.53

6 AERATED CONCRETE BLOCK SPECIMENS AT DIFFERENT TEMPERATURES

AVERAGE WT OF THE BLOCK (KG)	ROOM TEMPERATURE IN ^{0}C	DURATION OF EXPOSURE (MIN)	CURING CONDITION AFTER EXPOSING TO TEMP	AVG COMPRESSIVE STRENGTH OF SPECIMEN
2	35	50	Water curing	3.0
		100	Water curing	3.5
		150	Water curing	2.0

7 CONCLUSION

1. When exposed to 1500°C, the compressive strength of the block decreases sharply, and then the block is immediately immersed in water to cool the block to room temperature.
2. It was discovered that the intensity has decreased by approximately 35%. As a result, it is not suggested to spray water directly on the surface of aerated concrete blocks in the event of a fire.
3. A grouting thickness of 2 mm is not suggested for a 1:6 lean cement mortar mixture. A minimum thickness of 4 mm 4 CM is ideal when utilised as a mortar joint in a 1:6 ratio. At temperatures over 500°C, surface fractures on the plastered surface were detected.
4. However, this will need further test data. According to limited study on the scale model, the Aerated Concrete model provides higher thermal comfort than the Solid Concrete Blocks model.

8 REFERENCES

1 Arun Kumar, O.P. Singh, Progress in thermal comfort and energy-saving building materials, J. Recent patented projects. 7.3 (2013) 220-232.

2 Abdullah Keyvani, "Thermal performance and fire resistance of aerated concrete exposed to humid conditions", International Journal of Engineering Research, Volume 3, Issue 3, March 2014, PP267272.

3 Pruteanu, Marian & Vasilache, Maricica. (2013). Determination of the thermal conductivity of aerated concrete elements in enclosed masonry walls. Bulletin of Jassy Institute of Technology, Architecture. Construction part. LIX (LXIII)。 3342.

4 Prakash T M, Naresh kumar B G and Karisiddappa, "Strength and elastic properties of aerated concrete

masonry" International Journal of Structural and Civil Engineering Research, Volume 2, Issue 1, March 2014, PP267272.

5 Reddy, M.M., Reddy, K.R.S., Asadi, S.S., 2018. Research on the compressive strength of using fly ash and sugar cane ash instead of traditional concrete. International Journal of Pure and Applied Mathematics, 119 (14), pp. 17871791.