

CASTING AND ANALYSIS OF HOLLOW BRICK

P. B. Pande^a, A Donode^b, C D Chintawar^c, J Bhore^d, O Potdar^e, P Bhav^f, D Dhage^g.

A Assistant Professor, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

B Student, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

C Student, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

D Student, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

E Student, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

F Student, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

G Student, Yeshwantrao Chavan College of Engineering, Nagpur-441110, India.

CORRESPONDENCE – C D Chintawar 20030009@ycce.in , Yeshwantrao Chavan College of Engineering, Nagpur, India-441110.

ABSTRACT

Fly Ash bricks can be considerably used in all erecting constructional conditioning analogous to that of common burnt complex bricks. The cover ash bricks are comparatively lighter in weight and stronger than common complex bricks. Since cover ash is being accumulated as waste material in large volumes near thermal power shops and creating serious environmental pollution problems, its application as the main raw material in the manufacture of bricks won't only produce ample openings for its proper and useful disposal but also control environmental pollution to a lesser extent in the girding areas of power shops. The concave corroborated bricks were prepared without the use of conventional cement. Chase dust and beach were used as fine summations of sustainable accouterments. The parcels of these bricks were determined for different parameters. The experimental results reveal that the bricks are suitable to be used for the construction of masonry structures. The main motive of this paper is to apprehensive people about the different devastating effects that are sluggishly killing our terrain using red complex bricks and to promote the operation of fly ash bricks.

Keywords: - Fly Ash Bricks, Lightweight, Stronger, Waste Material, Environmental Pollution, Sustainable Additions, Masonry Structures.

INTRODUCTION

In the building business, the current invention presents Hollow Reinforced Brick, which will provide the right ambiance and comfort. Additionally, the brick's overall quality is improved by its improved water resistance, good strength, and strong heat resistance combined with its practical size.

It focuses on. To supply the construction sector with lightweight hollow bricks in suitable sizes. To manufacture high-quality, eco-friendly, and cost-effective hollow bricks. The reinforcement material is used to increase strength. To lower the structure's self-weight.

The production of burnt clay bricks necessitates the use of coal, which results in greenhouse gas emissions. The major raw material used in manufacturing bricks is soil, which is frequently taken from prime agricultural land, resulting in environmental degradation as well as economic loss owing to agricultural land diversion. The use of traditional brick-firing technology causes significant local air pollution. In India, the burnt clay brick business generates around 180 billion clay bricks per year, contributing significantly to soil erosion and unprocessed emissions. Simultaneously, thermal power plants in India continue to generate massive amounts of fly ash, the disposal of which causes enormous issues for the power plants.

Coal is India's primary energy source, and it will continue to be the primary source of thermal power for the next few decades. Thermal power plants provide over 65% of India's power (TPP). The high ash concentration of Indian coals (30% to 40%) contributes a significant amount of fly ash. Currently, it is projected that roughly 160 million tons of fly ash are produced each year.

Fly ash output is expanding at such a rate that the cement industry alone will be unable to utilize it. One of the answers to the country's growing fly ash disposal problem is the production of construction materials, notably bricks, utilizing fly ash.

DESCRIPTION

The whole idea focuses on addressing the problems connected with ordinary brick, such as seepage, heat resistance, and clay scarcity. It also addresses environmental issues such as efficient fly ash disposal, which is one of the answers to the country's ever-increasing fly ash disposal problem.

Furthermore, the hollow bricks provide exceptional sound isolation. Sound insulation is described as the ability of architectural features to decrease sound transmission. The thickness of the wall influences sound transmission. Because of its solid construction, the hollow reinforced brick wall offers good sound insulation.

Hollow reinforced bricks are utilized in numerous forms of construction for both load-bearing and non-load-bearing walls due to their strength and endurance. They are also utilized for various reasons such as a. infrastructure construction b. factories c. warehoused. power plant e. high rise constructions etc. f. pavement construction g. tanks, underwater works h. canal lining i. irrigation work j. retaining walls.

The use of Hollow Brick reduces the mortar consumption in the posterior quantum hence reducing the use of cement which in turn affects the cost of the design. These bricks have superior thermal sequestration material, which reduces the heat transfer through the wall of the structure. These bricks are provident as compared to solid blocks. Concave blocks have a depression inside which reduces the weight of bricks hence when placed, transfer a small dead cargo. It has a good sound sequestration property. The material used in the construction of concave slipup is completely terrain friendly which makes a concave slip-up an eco-friendly material considering its construction does not beget pollution. Concave bricks have acceptable strength which makes them usable for cargo-bearing structures. Concave Bricks are largely durable and bear lower conservation around the time period of their design life. Bricks are good fire- resistant Easy as well as fast construction systems Have better Architectural features Good Compressive strength depression of bricks provides passage for electrical cables Passage for plumbing institutions through the wall.

DRAWINGS

Referring now to the drawings, the depictions are just for the purpose of displaying a preferred embodiment of the invention and are not intended to limit the same. The designs are created with CAD software in order to fully comprehend the system.

Figure 1 shows the illustrative Complete Assembly of the proposed apparatus with an integrated view comprising of all the subsequent sections according to present invention.

Figure 2 shows the illustrative of brick.

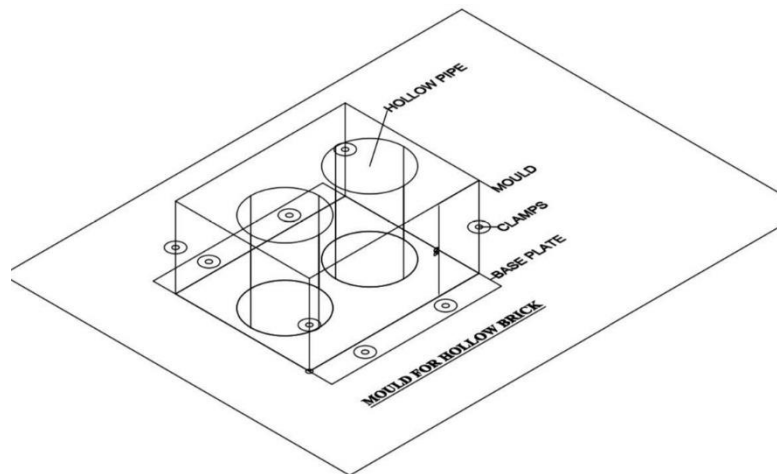


Figure 1

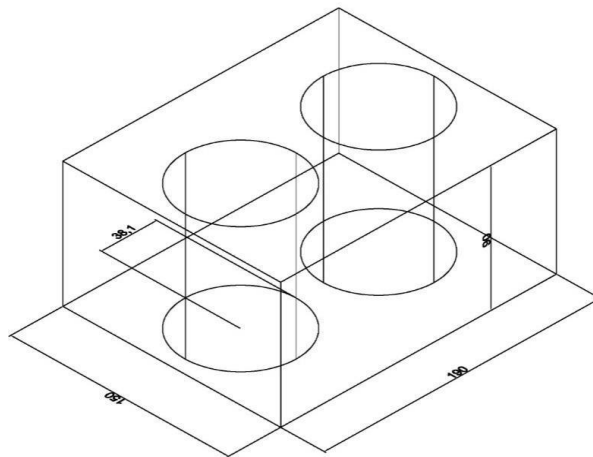


Figure 2

SIZE AND COMPOSITION

These bricks have the most practical proportions (Length X Width X Height) of 190 X 150 X 90 mm. The suggested bricks have a compressive strength of 8.54Mpa, which meets the minimum compressive strength requirement of IS-3495: 1976. Hollow bricks are about 20% lower in weight. These bricks absorb around 15% of their whole weight in water. The proposed bricks are sturdy and long-lasting, which will aid in reducing the generated heat inside the structure caused by the cavity. Furthermore, the notion of reinforced brick is offered, as well as the idea of making bricks water-resistant.

Composition of bricks

TR AIL S	FLY ASH %	STON E DUST %	CEMENT %	LIME %	LATH E SCRA P	STAIN REPELLE NT
1	60	15	15	3	6	1
2	50	25	12	2	1 0	1
3	53	15	20	4	7	1
4	50	28	20	2	-	-
5	48	30	20	2	-	-
6	53	30	15	2	-	-



Actual Form Work for Brick



Mixing and Placing of Materials



Test – Compressive Strength

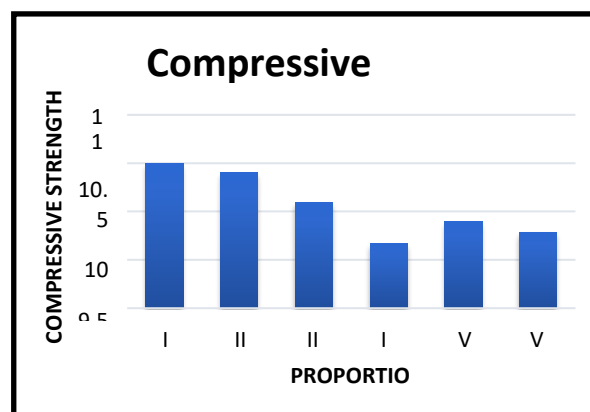
Why is fly ash used in bricks?

Fly ash bricks are not only completely dependable, but they also outlast any other building material. They are lightweight and have high compressive strength, making them ideal for multi-story buildings with reduced stress. It also absorbs less heat, keeping the building cool in our country's humid environment. It keeps its shape and requires less mortar during construction.

Stain Repellent

Stain Repellent SCWR-20 is a water-repellent sealant that may be diluted and is specifically developed for mineral construction materials and mineral items. Its water-repellent feature extends the life of the mineral surface. SCWR-20 is based on cutting-edge technology that reacts with ambient carbon dioxide to generate a protective layer inside the mineral substrate's surface. This protective layer is responsible for the product's superior hydrophobic effect and increases the mineral substrate's life and attractiveness.

DAY OF TESTING	COMPRESSIVE STRENGTH (N/mm ²)					
	I	II	III	IV	V	VI
7 TH DAY	5.5	4.5	5	3.5	4.03	4
14 TH DAY	8	7.5	7	6	6.2	6.5
28 TH DAY	10.5	10.4	10.09	9.67	9.9	9.78



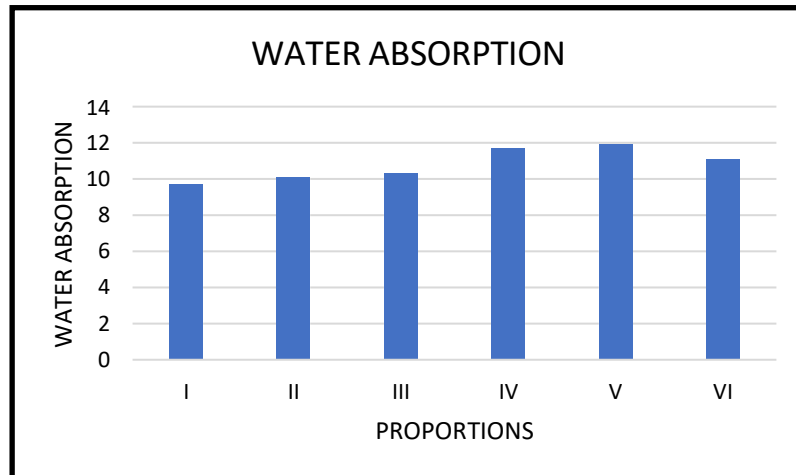
The compressive strength of the bricks is then compared with the standard requirements. The standard compressive strength for bricks varies depending on the type of brick and the application. For example, for load-bearing bricks, the compressive strength should be greater than or equal to 35 N/mm², while for non-load bearing bricks, the compressive strength should be greater than or equal to 7.5 N/mm².

The compressive strength test is an essential test that helps to determine the load-carrying capacity of bricks and ensures their suitability for use in construction. By following the above procedure, the compressive strength of the bricks can be accurately determined and compared with the standard requirements. This helps to ensure that only high-quality bricks are used in construction projects, ensuring the safety and longevity of the structure.

From the results obtained compressive strength for optimal mix is 10.05 MPa. It is greater than the standard value of 7.5 MPa. And also observed that the maximum strength is obtained when reinforcing material is used.

Water Absorption results:

Proportions	W1	W2	W2-W1	(W2-W1)/W1	% Absorption
I	2.86	3.14	0.28	0.097	9.7
II	2.45	2.80	0.35	0.101	10.1
III	2.40	2.649	0.249	0.103	10.3
IV	2.67	2.99	0.32	0.117	11.7
V	2.79	3.128	0.338	0.119	11.9
VI	2.88	3.20	0.32	0.111	11.1

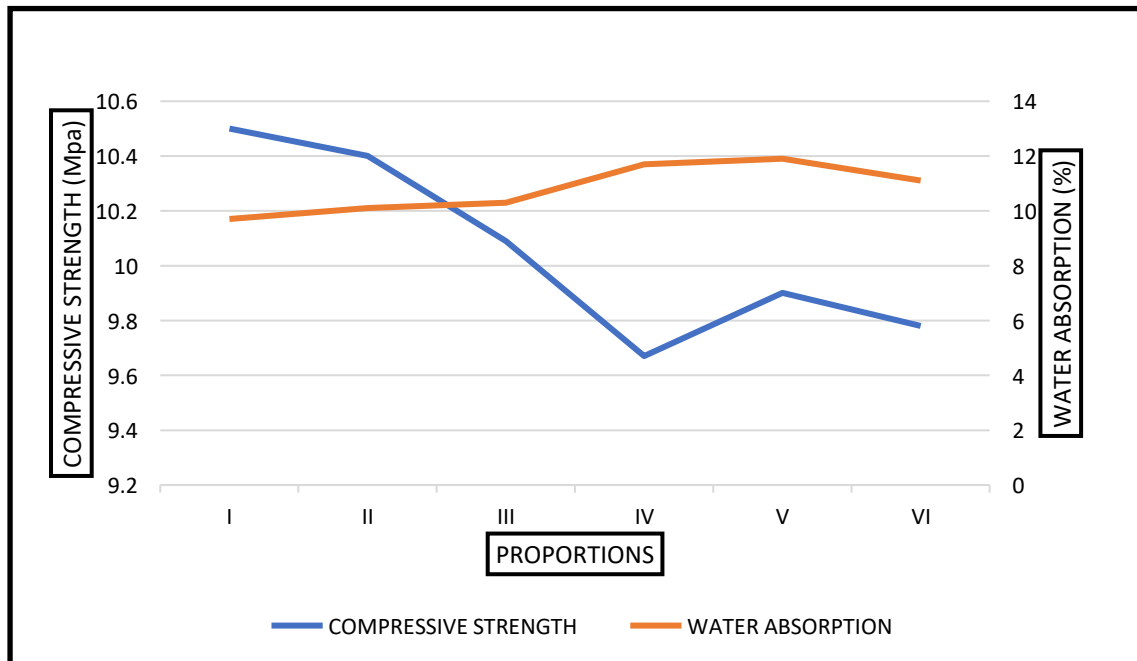


The water absorption of the bricks is then compared with the standard requirements. The standard water absorption for bricks varies depending on the type of brick and the application. For example, for a load-bearing brick, the water absorption should be less than or equal to 20%, while for a non-load-bearing brick, the water absorption should be less than or equal to 22%.

The water absorption test is an important test that helps to determine the ability of bricks to resist the penetration of water. This test is important in determining the suitability of bricks for construction purposes, especially in areas where exposure to moisture is high. A higher water absorption rate can lead to increased water damage, which can compromise the structural integrity of a building. By conducting a water absorption test, builders and engineers can ensure that the bricks used in construction have the necessary water resistance properties.

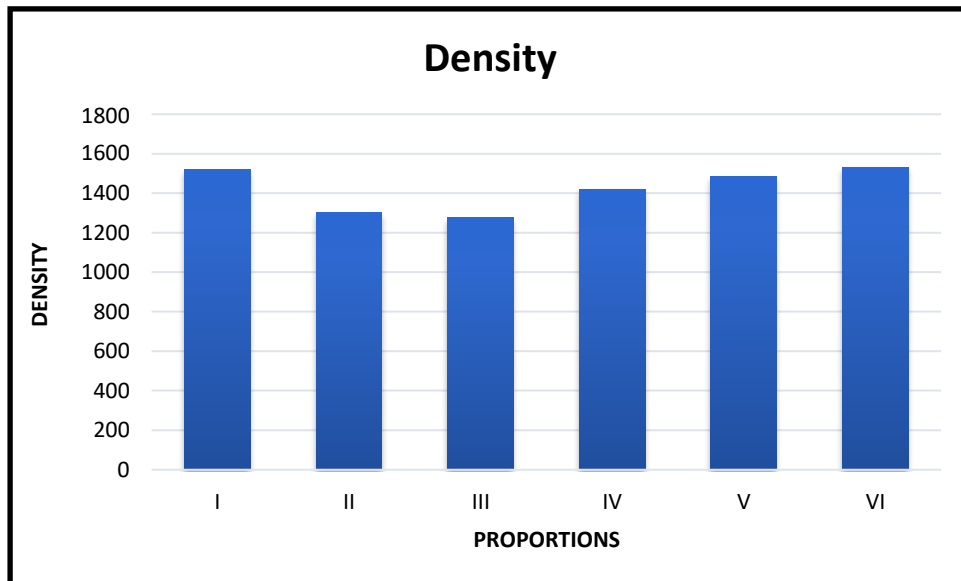
From the results obtained water absorption for optimal mix percentage is 10.9%. It is lesser than the standard value of 12%. And also observed that for maximum strength only a good water absorption obtained. The following figure shows the

variation of water absorption with compressive strength of brick.



Specific Density

PROPORTIONS	DRY WEIGHT OF BRICK (W)	VOLUME OF BRICK (V)	DENSITY = W/V	AVERAGE DENSITY
I	2.86	1.879×10^{-3}	1522.08	1423.625
II	2.45		1303.88	
III	2.40		1277.27	
IV	2.67		1420.96	
V	2.79		1484.83	
VI	2.88		1532.73	



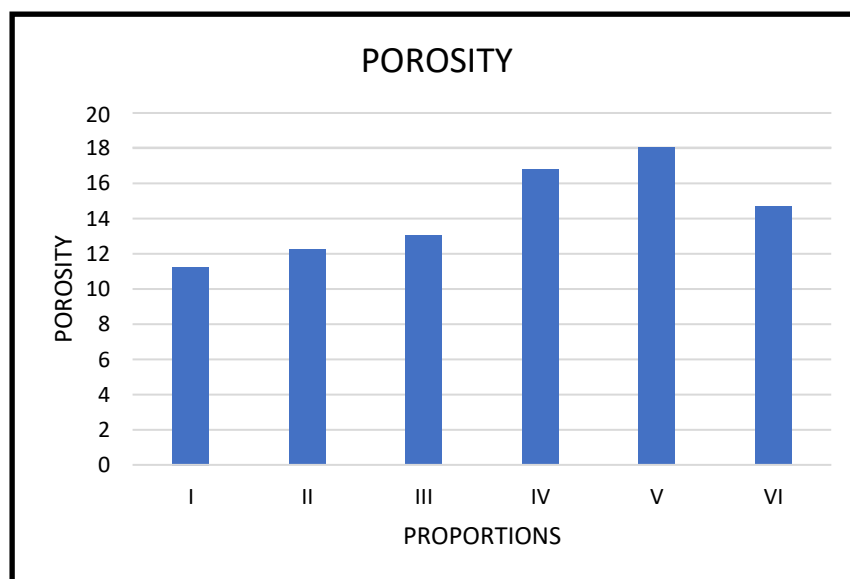
Comparison with Standard Requirements:

The specific density of the bricks is then compared with the standard requirements. The standard specific density for bricks varies depending on the type of brick and the application. For example, for a load-bearing brick, the specific density should be between 1900 kg/m³ to 2200 kg/m³, while for a non-load bearing brick, the specific density should be between 1400 kg/m³ to 1800 kg/m³.

The specific density test is an essential test that helps to determine the quality and suitability of bricks for construction purposes. This test ensures that the bricks meet the required standards and can withstand the weight and pressure of the building structure. The procedure for conducting a specific density test on bricks involves the preparation of test samples, calculation of volume and mass, calculation of specific density, calculation of average specific density, and comparison with standard requirements. By following this procedure, an accurate representation of the specific density of the entire lot can be obtained. From the results obtained Density for optimal mix is 1423.625 kg/m³. Which is in the range, required for non-load bearing bricks.

APPARENT POROSITY

PROPORTIONS	DRY BRICK WEIGHT (W1)	WET BRICK WEIGHT (W2)	WET OF WATER ABSORBED (W2 – W1)	POROSITY = W2-W1/W1 * 100
I	2.7	3.14	0.44	11.26
II	2.4	2.80	0.4	12.26
III	2.35	2.649	0.299	13.04
IV	2.56	2.99	0.43	16.79
V	2.65	3.128	0.478	18.03
VI	2.79	3.20	0.41	14.69



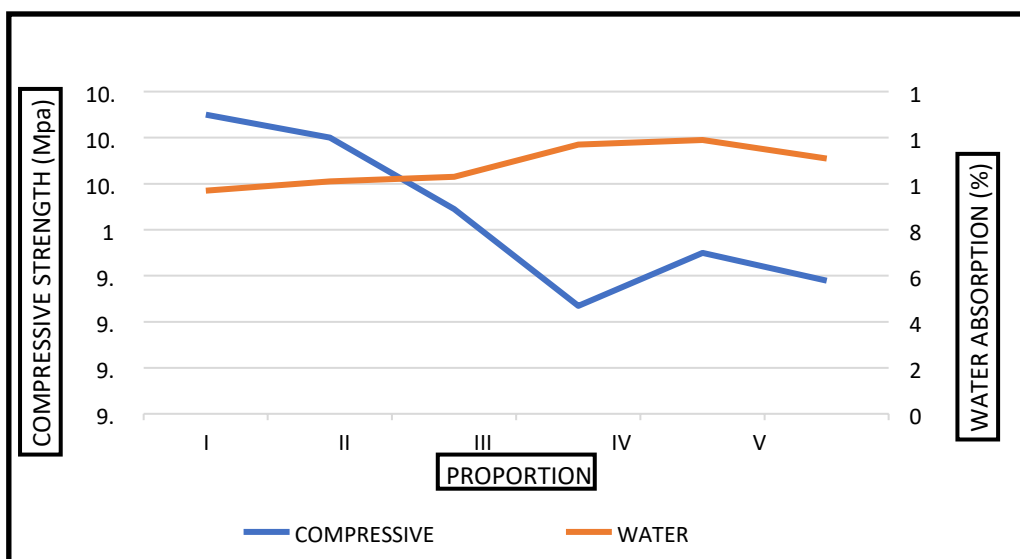
The Apparent Porosity of the bricks is then compared with the standard requirements. The standard Apparent Porosity for bricks varies depending on the type of brick and the application. For example, for a load-bearing brick, the Apparent Porosity should be less than or equal to 20%, while for a non-load bearing brick, the Apparent Porosity should be less than or equal to 25%.

The Apparent Porosity test is an essential test that helps to determine the suitability of bricks for construction purposes. This test ensures that the bricks can

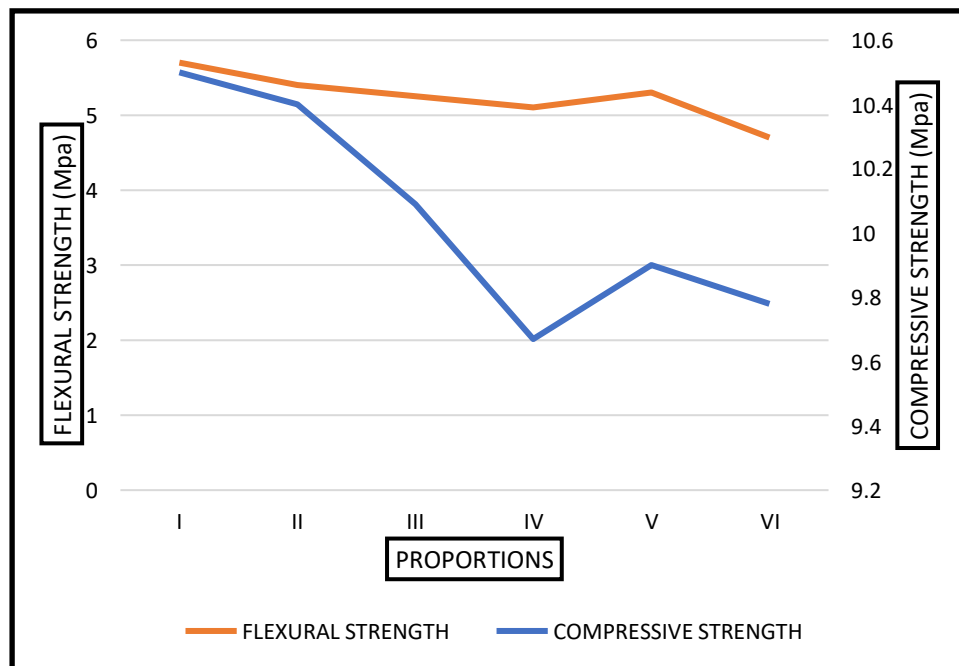
withstand the weight and pressure of the building structure and have the required level of strength and durability. The procedure for conducting an Apparent Porosity test on bricks involves the preparation of test samples, drying of the test samples, filling the sample, calculation of Apparent Porosity, calculation of average Apparent Porosity, and comparison with standard requirements. By following this procedure, an accurate representation of the Apparent Porosity of the entire lot can be obtained.

From the results obtained, Porosity for optimal mix is 14.34% which is in the range required for non-load bearing bricks i.e., less than 25%

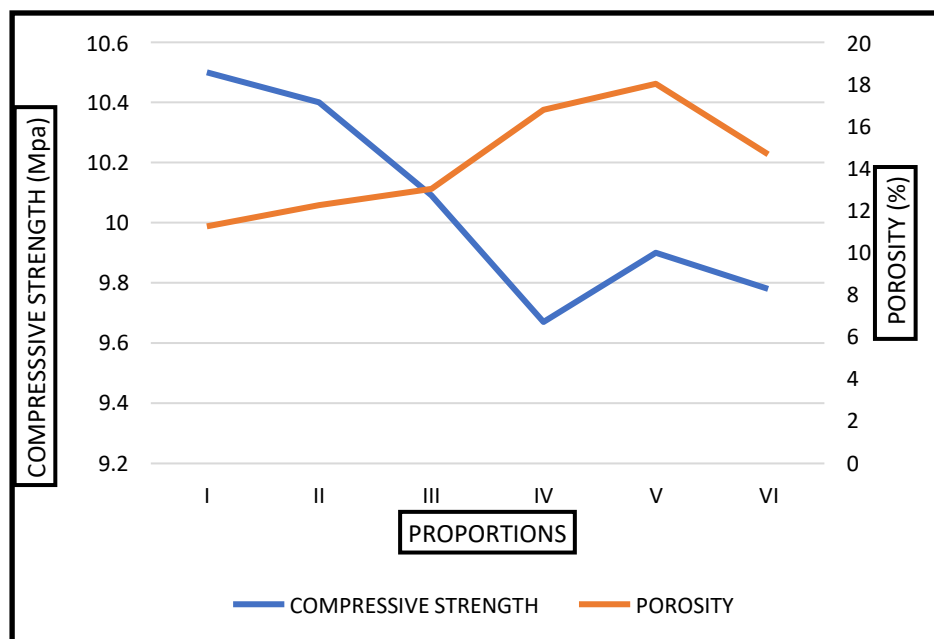
COMPARISION GRAPHS



Comparison of Compressive Strength and Water Absorption



Comparison of Compressive and Flexural Strength



Comparison of Compressive Strength and Porosity

The graph presents a comparison of the results obtained from various tests performed. The data illustrates the outcomes of these tests, allowing for an analysis of their relative performance.

Overall, the graph underscores the diversity in performance among the tests, with each excelling in different parameters. This suggests that the choice of test should be based on the specific parameter of interest, as different tests yield varying outcomes. A comprehensive evaluation of these results will facilitate informed decision-making and enhance the understanding of the tests' strengths and weaknesses.

CONCLUSION

In conclusion, this research paper focused on investigating the effects of reinforcing agents on the strength of fly ash bricks. The findings demonstrate that fly ash bricks with reinforcing agents have significantly greater strength than traditional fly ash bricks. This improvement in strength enhances their reliability and durability, making them a promising building material.

The study also highlighted the sustainable aspects of fly ash bricks. The hollow design of these bricks offers benefits such as temperature control, sound insulation, and improved energy efficiency. Additionally, the use of fly ash as a raw material makes the bricks lightweight, reducing transportation costs and energy consumption during construction.

Furthermore, the cost of fly ash bricks can be controlled by adjusting the cement content, making them an affordable alternative to traditional cavity wall materials. This versatility in customization enables the production of bricks that meet specific construction requirements and budgets.

Moreover, the use of fly ash in the production of bricks provides significant environmental benefits. By utilizing waste materials like fly ash, the impact on the environment is reduced, promoting sustainability in the construction industry. Additionally, the use of fly ash helps mitigate the environmental impact of coal-fired power plants, contributing to a cleaner and more sustainable energy future.

However, it is important to note that further research is needed to fully understand the effects of reinforcing agents on hollow reinforced fly ash bricks and their long-term durability. Standardized manufacturing processes and regulations are also crucial to ensure the quality and reliability of these bricks. Additionally, the construction industry should continue to prioritize the use of sustainable building materials to reduce environmental impact and foster a more sustainable future.

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