INCORPORATION OF GRANITE AND MARBLE POWDER WASTE IN FLY ASH BRICKS

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Abstract: *Building industries are the support for infrastructure development in India. The various By-products produced from industries grounds pollution in India. It has a major effect in the healthier environment of the Nation. The combinations of fly ash bricks have a mixture of percentage of the fly ash, granite and marble powder. In India thermal power plants and granite production are generating fly ash and granite dust in huge quantities. Industrial waste are destructive in nature, their disposal is of major concern. Recycling such wastes by exploiting them into building materials is a moderate resolution for the pollution problems. The search was carried out by various mix ratios using the laboratory test likes compression test, water absorption test. For strength characteristics, the results exposed that a frequently increase in compression strength, water absorption values in blocks was good while comparing the features compressive strength of bricks. The ceramic powder is mixed as bricks 5%, 10% and 15% of each mix proportions. To find materials properties, Water Absorption Test, Efflorescence Test, Soundness Test, Structure Test, Size and Shape Test, Density Test, Structural Strength were noted the ranges value of the specimen to compare the optimum dosage of ceramic powder.*

Keywords: *Fly Ash, Granite Powder, Marble Powder, Water absorption, Compressive strength, Density, Efflorescence, Soundness, Shape and Size, Hardness,*

1. INTRODUCTION

Demand for the construction materials is growing day to day in housing sectors in both rural and urban areas. The reduction in the sources of sand and the need to decrease the cost of construction projects has resulted in the increase need to classify different construction materials to sand as fine aggregates in the construction projects.

Bricks are one of the conventional materials used in centuries. In world, Asia produced nearby 87% of bricks. India and china are the major patrons of bricks, so an alternative and eco friendly materials to overcome the problem.

Marble and Granite powder is a by- product from the crushing process. It is estimated that 20% of ceramic powder in an issue of disposal and this creates environmental issues and landfill problems. It is good alternative during construction projects. In this project, the properties and features of ceramic powdered are studied.

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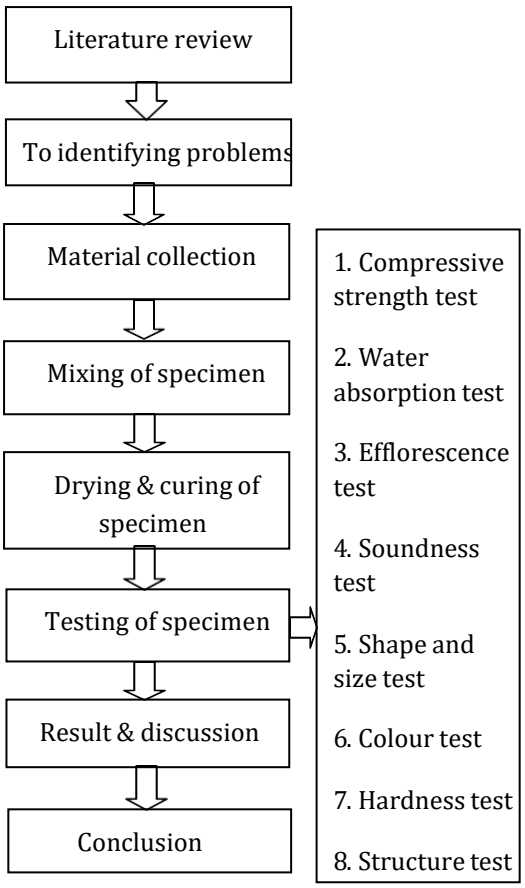
2. METHODOLOGY

Shows the methodology adopted this study



3. MATERIAL PROPERTIES

FLY ASH

Fly Ash is a by-product of the ignition of pulverized coal in electric power generation plants. This ash has pozzolanic properties. In the occurrence of water and free lime, the ash will react into cementations compounds.

Fig.1.Fly ash

3.2. CEMENT

A cement is a binder, a constituent used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is infrequently used on its own, but somewhat to bind sand and gravel (aggregate) together. Cement mixed with fine aggregate produces mortar for brickwork, or with sand and gravel, produces concrete.

Fig.2.Cement

LIME

Lime is calcium comprehending inorganic material in which carbonate, oxide and hydroxide predominate. In the stringent common sense of the term lime is calcium hydroxide. Lime is used in construction materials is largely classified as pure, hydraulic and poor lime can be usual or non-natural and may be additional familiar by its magnesium substance such as magnesium lime.

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Fig.3.Lime

GRANITE POWDER

Granite is a material used indoor flooring. The industry's throwing away of the granite powder material, consisting of very fine powder, at present constitutes one of the ecological harms around the world. Main waste generating industries is the granite quarry and production industry. Major waste generating industries is the granite quarry and production industry by which around 70% of this precious mineral source is wasted in the mining, processing, and polishing measures.

Fig.4.Granite powder

3.5 MARBLE POWDER

Marble is a metamorphic rock that forms as soon as limestone is subjected to the heat and pressure of metamorphism. It is collected for the most part of the mineral calcite ($CaCO_3$) and regularly contains other minerals, such as clay minerals, micas, quartz, pyrite, iron oxide, and graphite.

Fig.5.Marble powder

4. DESIGN MIX

Table-1**:** (Mix Proportion) Conventional Brick

Flyash %	Lime %	Gypsum %
50	30	20

Table-2: (Mix Proportion) Flyash+ Granite Powder

Flyash %	Lime %	Gypsum %	Granite powder %
45	30	20	5
40	30	20	10
35	30	20	15

Table-3**:** (Mix Proportion) Flyash+ Marble Powder

Flyash %	Lime %	Gypsum %	Marble powder %
45	30	20	5
40	30	20	10
35	30	20	15

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5. EXPERIMENTAL PROCEDURE AND TEST RESULT

Compressive Strength Test

Crushing strength of bricks is calculated by insertion brick in compression testing machine. After placing the brick, apply load on it awaiting brick breaks. Note down depressed the value of breakdown load and discover out the crushing strength value of brick. Lowest amount crushing strength of brick is 3.50 N/mm^2. If it is a smaller quantity than 3.50 N/mm^2, Then it is not productive for construction purpose.

The crushing strength of brick is expressed in N/mm^2 and it is calculated by isolating the maximum load and the area of the brick.

Fig.6.Compressive strength test

Table-4: Compressive strength test

Bricks sample	Compressive strength		
Trial	7 days N/mm^2	14days N/mm^2	21days N/mm^2
1	3.68	5.71	8.31
2	3.93	5.84	8.35
3	3.60	5.09	7.96

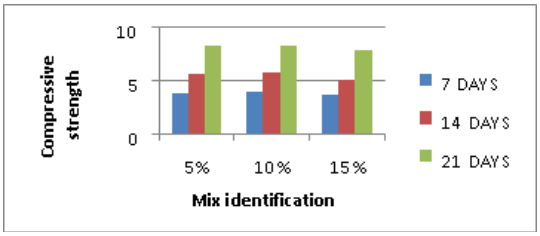

Chart.1.Compressive strength test of fly ash brick

Water Absorption Test

Water Absorption investigation is conducted on brick to discover out the sum of humidity content absorbed by brick under tremendous condition. In this analysis, sample dry bricks are taken and weighed. For a high-quality brick the sum of water absorption should not go beyond 20% of weight of dry brick.

Fig.7.Water absorption test

Table-5: Water absorption test

Brick samples	Water Absorption test in percentage			
Trial	S1	S2	S3	Mean
1	16.89	16.40	15.63	16.41
2	16.74	16.64	16.13	16.50
3	17.37	17.06	16.32	16.91

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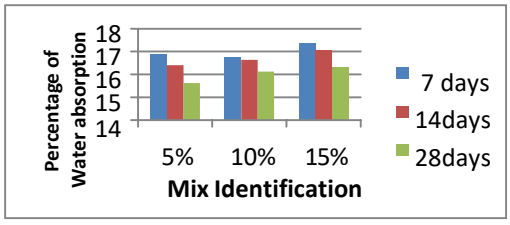

Chart.2.water absorption test of fly ash brick

Density Test

Density is how impenetrable an object; it is intended by dividing the mass by volume of an object. Density can be changed by Changing the size or shape of the entity. The standard international unit to measure density is kilogram per cubic Meter (kg/m^3).

Table-6: Density of Bricks

Mix	Sample No.	Weight (Kg)	Density (Kg/m^3)	Average Density (Kg/m^3)
M1	1	3.105	2017.5	2128.2
	2	3.308	2149.4	
	3	3.413	2217.6	
M2	1	3.310	2150.7	2132.3
	2	3.345	2173.5	
	3	3.190	2072.7	
M3	1	2.979	1935.6	2015.1
	2	3.116	2024.6	
	3	3.209	2085.1	

Efflorescence Test

A first-class quality flyash brick be supposed to not contain any soluble salts in it. If soluble salts are there, then it will cause efflorescence on brick external. To be familiar with the presence of soluble salts in a brick, placed it in a water bath for 24 hours and dried out it in shade. After drying, observe the brick surface systematically. If there is some white or grey colour deposits, then it contains soluble salts and not constructive for creation.

Fig.8.Efflorescence test

Percentage of white spot in the brick = Nil.

Soundness Test

Sound and brick should not smash. Then it is assumed to be good flyash brick. reliability test of bricks shows the environment against hasty impact. In this test, 2 flyash bricks are selected randomly and struck with one another. Then sound produced should be clear bell ringing sound and brick should not rupture. Then it is assumed to be high-quality flyash brick.

Fig.9.Soundness test

Ringing sound in the all proportions of Bricks = clear ringing sound produced.

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Shape and Size Test

Shape and size of bricks are very significant consideration. All bricks used for building should be of same size. The shape of bricks should be simply rectangular with sharp edges. To make this test, select 20 flyash bricks erratically from group and stack them along its length, breadth and height and compare. So, if all bricks related size then they are qualified.

Fig.10.Shape and size test

Colour Test

Good brick should acquire bright and identical colour all over its body.

Hardness Test

Good brick must resist scrapes against sharp belongings. So, for this test a sharp tool or finger nail is used to formulate scratch on brick. If there scratch intuition on brick then it is assumed to be hard brick.

Fig.11.Hardness test

Structure Test

To know the formation of brick, pick one brick indiscriminately from the group and break it. Examine the inner portion of brick clearly. It should be free from lumps and identical.

Fig.12.Structure test

6. CONCLUSION

On comparing with clay brick, its shows better outcome in strength and heating load. Expenditure wise it is best in all cases. But it does not come below light weight blocks and thermal efficient. Thus, it is the most economic abundance among the building blocks we considered. Thus, it very suitable to far both framed and load bearing buildings.

1. After collecting and analysing all the results, we can terminate that, at 10% replacement of fly ash with granite and marble powder gives maximum compressive strength. After 15%, the compressive strength starts decreasing in in cooperation granite and marble powder.
2. So we can analyzed that 10% replacement of granite and marble powder is most favorable.

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