EXPERIMENTAL INVESTIGATION ON CELLULAR LIGHT WEIGHT CONCRETE BLOCK USING IRONITE POWDER FOR REPLACEMENT OF CEMENT

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ABSTRACT
In recent years, with expanding urbanization and increasing demand for construction materials, brick kilns have to grow to meet the demand. It has directly or indirectly caused a series of environmental and health problems. Cellular Light Weight Technology blocks can be used as an alternative to the red bricks, to reduce Environmental pollution and Global warming. CLC blocks are environment friendly. The energy consumed in the production of CLC blocks is only a fraction compared to the production of red bricks and emits no pollutants and creates no toxic products or by products. cellular concrete blocks are concrete blocks having homogeneous, uniformly distributed and stable void or air cells. The cell structure is attained with the addition of preformed stable foam in the concrete mix. These blocks are light weight, eco-friendly, economical and better alternative to conventional burnt clay bricks and cement concrete blocks in the modern building industry. This paper presents an experimental study carried out on bricks made from fly ash. The use of lightweight foamed concrete offer many benefits and advantageous particularly cost saving, fast completion and easy application compared to other materials such as steel and timber. Hence the present investigation was taken up with a view to verify the suitability, feasibility and potential use of ironite powder. The ironite powder has been taken for partial replacement with cement. This investigation also aims to use waste materials effectively since ironite is a waste obtained from metal wastes. The properties of the Cellular blocks are investigated by conducting various tests like Compressive strength test, water absorption test and flexural test. 0%,10%,20%,40% ironite powder, have been added for testing and validation of new form of brick.

Keywords: *Light Weight Technology blocks, fly ash, as Ironite-R, Admixture, CO2*

1. INTRODUCTION
A brick is a masonry building material used to construct walls, pavements, and other features. The term brick originally referred to a clay unit, but it is today used to refer to any rectangular unit put in mortar. Fired bricks were used in the olden days. Burnt bricks, also known as synthetic stone, are one of the most durable and powerful building materials, having been used since 5000 BC. Air-dried bricks, also known as mud bricks, have a longer history than fired bricks and include a mechanical binder such as straw. Bricks are set in

guides in a variety of styles called bonds, which are combined to form brickwork, and can be laid in a variety of mortars to keep the bricks together and create a long-lasting structure. Ironite is an ore taken from the iron ore .It was used in flooring so that it can withstand heavy vehicles. Now a day's Strength Increasing Admixture for Concrete, also known as Ironite-R, is used to enhance the working of concrete. The plasticizing action of Strength Increasing Admixture for Concrete helps to improve the appearance mobility and strength of the products. It can also be used for the reduction in cement without loss of strength. Further, these also have cement dispersing properties that helps in the greater utilization and hydration of cement. Also, Ironite is an acid-soluble metallic salt, which means that when it comes in contact with water or acid, it creates a liquid that imparts a permanent stain. Although this stain will not color everything and is not uniform in shade or transparency, it does provide a lovely mottled earthy brown stain to concrete. It is advisable that to perform a trial in an inconspicuous area to ensure that, the color it yields. The higher utilization of concrete leads to an increase in the cement demand gradually which effects the environment. The utilization of industrial waste products could be an appropriate solution for sustainable development in terms of minimizing environmental pollution and in order to deal with the blooming concern of carbon dioxide (CO2) production. BA was considered as "green" and environmentally friendly building materials to reduce the constituents of cement in the production of concrete. It is one of the waste materials that has introduced by the Construction. The thermal resistance is proportional to the thickness of a layer of the construction and inversely proportional to its conductivity. Thermal conductivity plays a significant role in efficient energy usage, especially in the construction field. Low thermal conductivity is preferable because lower thermal conductivity will increase the thermal insulation provided by the concrete and reduce the heating and cooling costs for residential and commercial buildings. One of the key factors for optimizing energy efficiency is thermal conductivity. When a building is constructed from materials with higher thermal conductivity, to ensure the internal temperature of the building, a greater amount of energy must be consumed for cooling and heating.

2. LITERATURE REVIEW

2.1. GENERAL

First and primarily, various books and journals were collected for reference and studied prior to beginning project work in order to have an idea of how the project should be. Alternative building bricks are used in this project. As a result, the fundamental and essential characteristics of bricks were first investigated.

2.2. LITERATURE SURVEY

SanthaKumar, et al,(August 2021).To investigate the aims to use granite fine powder (GFP) as an alternative raw material source for making foam-based cellular light weight concrete (CLWC). In this study, the weight ratios of GFP and binder were 0.8:1, 1:1, and 1.2:1. In this study, three different foam-binder ratios were used: 0.025, 0.05, and 0.1. The results of the experimental study revealed that, when compared to the GFP-binder ratio, the foam-binder ratio has a greater effect on the bleeding capacity, followability, strength, absorption, and permeable voids of CLWC. The distribution of voids in CLWC during the fresh and hardened states is significantly influenced by the GFP-binder ratio and the foam-binder ratio, as determined by microscopic image analysis.

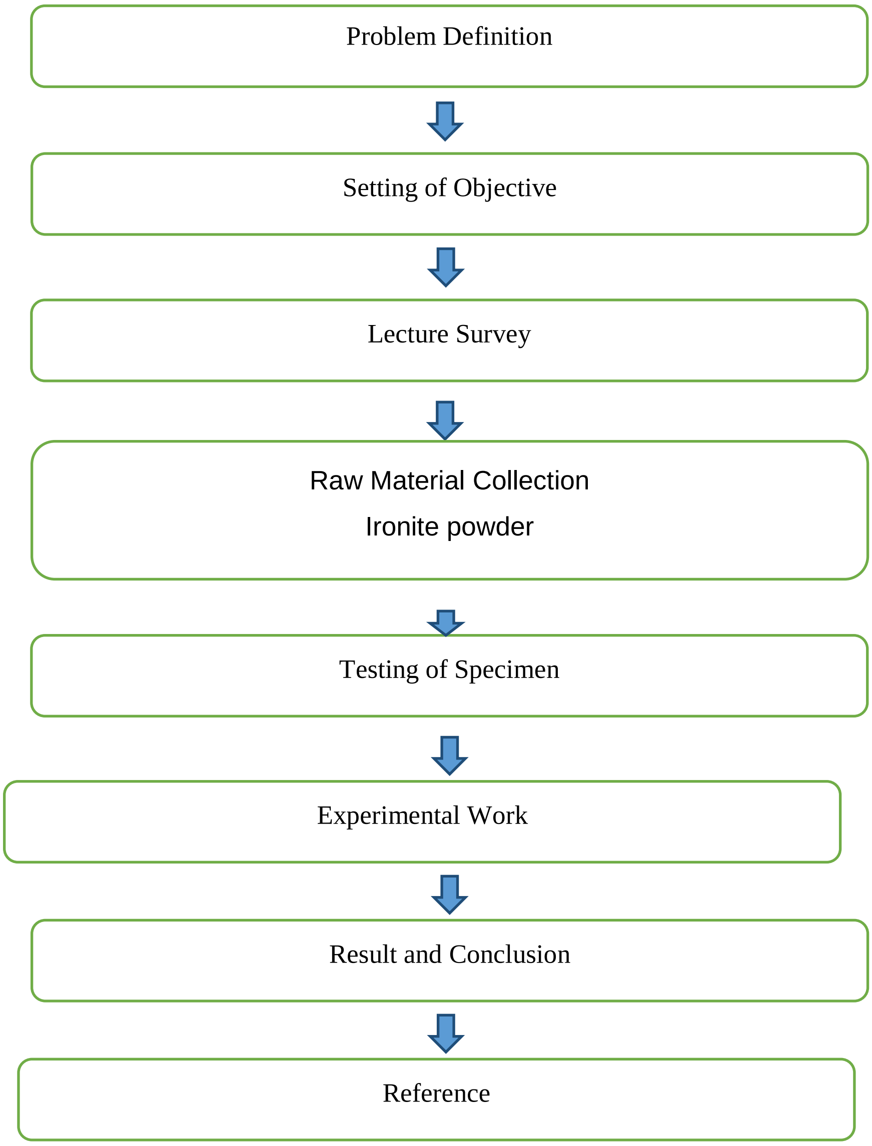
Abrahama, et al,(November2021) To investigates the properties of cellular lightweight concrete (foamed concrete) made from palm oil industry wastes, specifically palm oil fuel ash (POFA) at 10% as cement replacement and palm oil clinker (POC) at 50% and 100% as sand replacement, to produce 1200 kg/m3 foamed concrete. Six different foam concrete mixes were prepared, and various tests were performed on fresh density, flow table, ultrasonic pulse velocity (UPV), compressive strength, and splitting tensile. The results show that using 10% POFA as a cement replacement and 50% POC sand produced the required strength for structural grade. Under air curing, the highest compressive strength was achieved for the mix with POC100POFA10; however, under water curing, the highest compressive strength was achieved for the mix with POC50.

Abhishek Jain, et al,(November 2020)To investigate intends to use granite waste (GW) and fly ash as fine aggregate and cement alternatives, respectively, for the sustainable production of self-compacting concrete (SCC). Slump flow, T500 flow, V-funnel, J-ring, and L-box tests were used to evaluate fresh properties, while compressive strength, flexural strength, water absorption, and ultrasonic pulse velocity tests were used to evaluate hardened properties. The results of the fresh properties revealed that the incorporation of GW had a negative impact on them. However, the incorporation of fly ash improved the fresh properties and mitigated the negative effect of GW on the fresh properties to some extent. The addition of GW to SCC mixtures improved the hardened properties.

Ajay Chourasia, et al, (May 2020) To analyse the seismic performance of a confined masonry (CM) building using innovative light weight cellular (LWC) panels under displacement controlled quasi-static reversed cyclic lateral loading is investigated in this paper. The LWC panels were 590 270 140 mm in size, with four vertical holes 60 mm in diameter and a 35 mm high trough shaped groove for interlocking along the length. A full-scale CM building with a 2.91 m 2.91 m plan and a 3.01 m height was built, with 140 mm thick walls and a 100 mm thick reinforced concrete (RC) slab. During the CM building's construction, two vertical holes in panels were filled with an 8 mm diameter vertical reinforcing bar cast with M20 grade concrete, while the other two were left emptyat the corners, 140 140 mm RC tie-columns with four 10 mm diameter rebar’s were installed.

M. Purushothaman et al (2012) presented the experimental investigation on the effective use of bottom ash obtained from thermal power station as a replacement of fi ne aggregates and silica fume as a replacement of cement on the properties of High performance concrete (HPC). A preliminary study was made to determine the isolated effect and its optimum percentage of silica fume and bottom ash for making high performance concrete. With this preliminary data, further study was carried out on HPC. Totally 10 mixes were prepared for this tests. Out of which fi ve were HPC mixes and fi ve were Conventional Concrete (CC) mixes. HPC was prepared for various cement contents ranging from 300 kg/m3 to 500 kg/ m3 by replacing 10% of the volume of the cement by silica fume and 40% of the volume of the fi ne aggregate by bottom ash. The concrete mixes were evaluated for compressive, tensile and fl exural strengths at 28 days and to compare them with those of CC mixes prepared for various cement contents ranging from 300 kg/m3 to 500 kg/m3. The investigations revealed that the combined use of industrial wastes silica fume and bottom ash improved the mechanical properties of high performance concrete which is otherwise hazardous to the environment and thus these two materials may be used as a partial replacement material in concrete making.

3. METHODOLOGY



4.1. OBJECTIVE

1. To investigate the physical properties of the materials used in cellular light weight concrete blocks
2. To investigate the water absorption test for the cellular light weight concrete blocks
3. To study the compressive strength of cubes, flexural test by laboratory experiments for different days of curing.

4.2 SCOPE

1. Cellular light weight concrete block has greater strength than the burnt clay brick
2. Cellular light weight concrete block has less weight compared to the burnt clay brick
3. It is also expected that the final outcome of the project will have an overall beneficial effect on the utility of ironite powder concrete in the field of civil engineering construction work.

5. MATERIALS AND METHODS

5.1. COLLECTION OF RAW MATERIALS

The chosen material areironite material as to chosen because of easy availability on all place and reduce on the cost of manufacturing brick.

5.1.1 Ironite powder:

Ironite is an ore taken from the iron ore .It was used in flooring so that it can withstand heavy vehicles. Now a day's Strength Increasing Admixture for Concrete, also known as Ironite-R, is used to enhance the working of concrete. The plasticizing action of Strength Increasing Admixture for Concrete helps to improve the appearance mobility and strength of the products.

Table 1: Properties

Tests	Ironite powder
Physical Properties	
Specific Gravity	2.8
Consistency	30.5%
Chemical properties	
Calcium oxide	59.45
Potassium oxide	23.85
Sulfur trioxide	4.44
Magnesium oxide	1.70
Silicon dioxide	1.19
Sodium oxide	0.84
Ferric oxide	0.57

Fig 1: Ironite powder

5.2 CEMENT

The standard consistency of cement is that consistency, which permit the vicat plunger to penetrate to a point 5 to 7mm from the bottom of the vicatmould when tested. Procedure to determine the quantity of water required to produce a cement paste of standard consistency is described below.

Apparatus for Standard Consistency

1. Vicat Apparatus

The vicat apparatus consists of a frame having a movable rod with a cap at one end and at the other end any one of the following attachment, which are interchangeable:

1. Needle for determining the initial setting time
2. Needle for determining the final setting time
3. Plunger for determining the standard consistency

2. Needles

Needle for Initial Setting Time The needle is having a cross sectional area of $1mm^2$. The end of the needle is flat. **Needle for FInal Setting Time** The needle is circular having a cross sectional area of $1mm^2$. The needle is fitted with a metal attachment. The end of the needle projects beyond the cutting edge of the hollowed out metal attachment. **Plunger for Standard Consistency** It is of polished brass 10 ± 0.05mm in diameter with a projection at the upper end for insertion into the movable rod. The lower end is flat.

3. Movable Rod

Movable rod carries an indicator which moves over a graduated scale attached to the frame (certain models have an additional attachment of dash pot, which facilitates lowering of movable rod slowly).

4. Graduated Scale

Graduated scale is 40mm in length and the smallest division of scale is 1mm.

5. VicatMould

Single mould Thevicatmould is in the foam of a frustum of a cone having an internal diameter of 60+/-0.5mm at the top, 70 +/- 0.5mm at the bottom and height 40 +/_ 0.5mm. **Split type vicatmould** The split type vicatmould is used as an alternative to single mould. This mouldconsist of a split ring having an internal diam
eter 80+/- 0.1mm and a height 40+/_0.5mm. A non-porous base plate is provided. The split mould is provided with a suitable clamping ring.

Procedure for Standard Consistency of Cement

1. Keep the vicat apparatus on a level base (when using vicat apparatus with dashpot, keep the bearing movable rod to its highest position and pin it.) Unscrew the top of the dashpot. Half fill the dashpot with any suitable oil of viscosity and screw the top. Work the plunger a number of times.
2. Attach the plunger for determining standard consistency to the movable rod. Work the plunger a number of times.
3. Take 400 gm of cement in a pan and a weighed quantity of water in a beaker.
4. Prepare a paste with the water added to cement. Start a stopwatch at the time of adding water to cement.
5. Keep the vicatmould on a non porous plate and fill the cement paste in it.
6. After completely filling the mould, shake it slightly to expel the air. Smooth off the surface of the paste making it level with the top of the moulder. The cement paste thus prepared is the test block.
7. Place the test block resting on the non porous plate under the movable rod, bearing the needle.
8. Lower the plunger gently to touch the surface of the cement paste and quickly release; (when vicat apparatus with dashpot is used, place the mould filled with cement paste and the non absorbent plate on the base plate of the vicat apparatus. Raise the plunger of the dash pot, bring it in contact with the top cap of the movable bearing rod.
9. Remove the pin holding the movable bearing rod to the surface of the cement paste and quickly release by pushing down the plunger to sink in to the paste). This operation shall be done immediately after filling the mould.
10. Prepare trial test specimens with varying percentages of water until plunger penetrates to a point 5 to 7mm from the bottom of the vicatmould, which is read on the scale. Express the water required as percentage by weight of the dry cement.

5.3 Setting time of the cement

The initial setting time of concrete is the time when cement paste starts hardening while the final setting time is the time when cement paste has hardened sufficiently in such a way that a 1 mm needle makes an impression on the paste in the mould but 5 mm needle does not make any impression.

Theoretically, Initial setting time of concrete is the time period between addition of water to cement till the time at 1 mm square section needle fails to penetrate the cement paste, placed in the Vicat'smould 5mm to 7mm from the bottom of the mould. Final setting time is that time period between the time water is added to cement and the time at which 1 mm needle makes an impression on the paste in the mould but 5 mm attachment does not make any impression.

Technical Aspects of Concrete Setting Times

1. It is essential that cement set neither too rapidly nor too slowly. In the first case there might be insufficient time to transport and place the concrete before it becomes too rigid. In the second case too long a setting period tends to slow up the work unduly, also it might postpone the actual use of the structure because of inadequate strength at the desired age.

2. Setting should not be confused with hardening, which refers to the gain in mechanical strength after the certain degree of resistance to the penetration of a special attachment pressed into it.
3. Setting time is the time required for stiffening of cement paste to a defined consistency.
4. Indirectly related to the initial chemical reaction of cement with water to form aluminum-silicate compound.
5. Initial setting time is the time when the paste starts losing its plasticity.
6. Initial setting time test is important for transportation, placing and compaction of cement concrete.
7. Initial setting time duration is required to delay the process of hydration or hardening.
8. Final setting time is the time when the paste completely loses its plasticity.
9. It is the time taken for the cement paste or cement concrete to harden sufficiently and attain the shape of the mould in which it is cast.
10. Determination of final setting time period facilitates safe removal of scaffolding or form.
11. During this period of time primary chemical reaction of cement with water is almost completed.

Procedure to Find Setting Time of Cement

Test Procedure

1. Consistency test to be done before starting the test procedure to find out the water required to give the paste normal consistency (P).
2. Take 400 g of cement and prepare a neat cement paste with 0.85P of water by weight of cement.
3. Gauge time is kept between 3 to 5 minutes. Start the stop watch at the instant when the water is added to the cement. Record this time (T_1).
4. Fill the Vicatmould, resting on a glass plate, with the cement paste gauged as above. Fill the mould completely and smooth off the surface of the paste making it level with the top of the mould. The cement block thus prepared is called test block.
5.

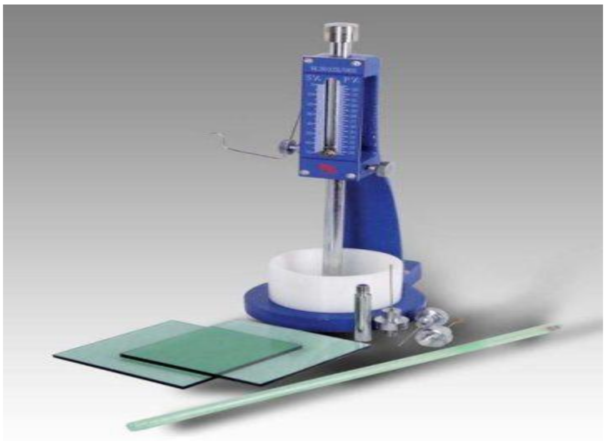


Fig 2: Vicat's Apparatus used for determination of setting time of cement

Test for Initial Setting Time

1. Place the test block confined in the mould and resting on the non-porous plate, under the rod bearing the needle.
2. Lower the needle gently until it comes in contact with the surface of test block and quick release, allowing it to penetrate into the test block.
3. In the beginning the needle completely pierces the test block. Repeat this procedure i.e. quickly releasing the needle after every 2 minutes till the needle fails to pierce the block for about 5 mm measured from the bottom of the mould. Note this time (T_2).

Test for Final Setting Time

1. For determining the final setting time, replace the needle of the Vicat's apparatus by the needle with an annular attachment.
2. The cement is considered finally set when upon applying the final setting needle gently to the surface of the test block; the needle makes an impression thereon, while the attachment fails to do so. Record this time (T_3).

Calculations

Initial setting time=T_2-T_1

Final setting time=T_3-T_1

Where,

T_1 =Time at which water is first added to cement

T_2 =Time when needle fails to penetrate 5 mm to 7 mm from bottom of the mould

T_3 =Time when the needle makes an impression but the attachment fails to do so.

5.4 Fineness test of cement

It is the property of cement that gives an idea about the size of particle in cement and thusurface area ratio.

5.5 Soundness of cement

Soundness of cement can be defined as its ability to retain its volume after it gets hardened. This means that a properly sound cement will undergo minimum volume change after it converts into the hardened state. In the soundness test of cement, we determine the amount of excess lime. This test can be conducted by Le-chatelier method and Autoclave Method. Here we will discuss Le-chatlier method of determining the soundness of cement.

Fig3: Soundness of cement le chatlier's Test Apparatus

Procedure For Soundness Test on Cement

1. The Le- chatliermould and the glass plates are lightly oiled before conducting the test
2. Prepare a cement paste as in consistency test with 0. 78 times the water required to give a paste of standard consistency
3. Fill the cement paste in the Le- chateliermould taking care to keep the edges of the mould gently together during the operation.

4. Cover the mould with another piece of a glass plate and place a small weight over the cover plate.
5. Submerge the whole assembly immediately in water at a temperature of 27o+-2oC and keep it there for 24 hours.
6. Take out the assembly again in water at 27+/- 2 deg C. The distance between the indicator points are measured as A.
7. Submerge assembly again in water at 27 +/- 2 deg C
8. Bring the water to boiling in 25 to 30 minutes and keep at boiling for 3 hours. The assembly should be immersed in water during this process.
9. Remove the mould from water and allow it to cool to 27 +/- 2 deg C
10. Measure the distance between the indicator points as B.

Calculations

Expansion= B- A = Here, A = The measurement taken after 24hours of immersion in water at 27 ± 2degree Celsius B = The measurement taken after 3hours of immersion in water at boiling temperature

Conclusion

The value of soundness of cement obtained for Ordinary Portland Cement (OPC), Low heat cement, high alumina cement and rapid hardening cement must not exceed 10mm. The Le-chatlier's Method helps us to determine the lime present in the cement in excess. This is the excess lime that causes expansion of cement.

5.6 Compressive strength of cement

(i) The mortar of cement and sand is prepared. The proportion is 1:3 which means that (X) gm of cement is mixed with 3(X) gm of sand.

(ii) The water is added to the mortar. The water cement ratio is kept as 0.4 which means that (X) gm of water is added to dry mortar.

(iii) The mortar is placed in moulds. The test specimens are in the form of cubes with side as 70.6 mm or 76 mm. The moulds are of metal and they are constructed in such a way that the specimens can be easily taken out without being damaged. For 70.6 mm and 76 mm cubes, the cement required is 185 gm and 235 gm respectively.

The mortar, after being placed in the moulds, is compacted in vibrating machine for 2 minutes.

(iv) The moulds are placed in a damp cabin for 24 hours.

(vi) The specimens are removed from the moulds and they are submerged in clean water for curing.

(vii) The cubes are then tested in **compression testing machine** at the end of 3 days and 7 days. The testing of cubes is carried out on their three sides without packing. Thus three cubes are tested each time to find out the compressive strength at the end of 3 days and 7 days. The average value is then worked out. During the test, the load is to be applied uniformly at the rate of 350 kg/cm2 or 35 N/mm2.

(viii) The **compressive strength of cement** at the end of 3 days should not be less than 115 kg/cm2 or 11.50 N/mm2 and that at the end of 7 days should no be less than 175 kg/cm2 or 17.50 N/mm2

Cement of grade 53 can be used for bending of material. Portland pozzolana cement conforming to IS: 269-1976 and IS: 7031-1968 was used in this study. The cement is of 53grade and the tests conducted oncement are tabulated.

Table 2 physical and chemical Properties of cement

Tests	Cement
Physical Properties	
Specific Gravity	3.18
Consistency	25%
Initial setting Time	30 minutes
Final setting time	550 minutes
Chemical Properties	
Calcium oxide	63.12
Potassium oxide	0.63
Sulfur trioxide	1.43
Magnesium oxide	2.16
Silicon dioxide	24.52
Sodium oxide	0.44
Ferric oxide	3.51

5.7 Water

Water is an important ingredient of papercrete as it actively participates in the chemical reaction with cement. The water is required for preparation of mortar, mixing of cement concrete and for curing work etc. during construction work. The quality and quantity of water has much effect on the strength of mortar and cement concrete in construction work. The water used for mixing and curing should be clean and free from injurious quantities of alkalis, acid, oils, salt, sugar, organic materials, vegetable growth and other substances that may be deleterious to bricks, stone, concrete or steel. Potable water is generally considered satisfactory for mixing. The pH value of water should be not less than 6.

Table 3 Properties of water

S.No	Property	Value
1.	P_h	7.1
2.	Taste	Agreeable
3.	Appearance	Clear

5.8 River Sand

River sand is a naturally occurring sand that is collected from riverbanks. It is the most common sort of sand used in building. River sand is sand with small particles. It has a silky feel to it. As a result, it's employed for plastering projects that demand a flawless finish, as well as RCC projects.

River sand has a whitish-grey hue to it. This sand binds well with cement, aggregates, and water to build concrete because of its smooth and fine texture. River sand is widely utilized in construction since it is less expensive than other types of sand because it is collected naturally.

5.9 Specific Gravity Test

Specific gravity of cement using Le Chaatelier flask or specific gravity bottle**.**Weigh a clean and dry Le Chatelier Flask or Specific Gravity Bottle with its stopper (W1). Place a sample of cement upto half of the flask (about 50 gm) and weight with its stopper (W2). Add kerosene (polar liquid) to cement in flask till it is about half full. Mix thoroughly with glass rod to remove entrapped air. Continue stirring and add more kerosene till it is flush with the graduated mark. Dry the outside and weigh (W3). Entrapped air may be removed by vacuum pump, if available. Empty the flask, clean it refills with clean kerosene flush with the graduated mark wipe dry the outside and weigh (W4)

5.10 CONSISTENCY TEST

SPECIMEN PREPERATION

In this project, we can design for the 4 types of specimen by change in the admixture of bricks. The different admixture are
Clc 0: 0% Ironite powderforcement
Clc 10: 20% Ironite powderforcement
Clc 20: 30% Ironite powderforcement
Clc 30: 30% Ironite powderforcement

5.11 STANDARD MIX DESIGN:

In present study M15 gradebrick was designed. The weight ratio of mix proportion is 1:4 keeping water cement ratio 0.4. It was proposed to investigate the properties of brick. In this experimental work, physical properties of materials used in theexperimental work were determined. M15 grade of reference brick was mixed and cured in potable water.

Table 4 Mix Design of samples

SAMPLES	CEMENT (grams)	Ironite powder (grams)	SAND (grams)	WATER CEMENT RATIO
Clc 0	667	0	2.688	0.4
Clc 10	600	67	2.688	0.4
Clc 20	537	134	2.688	0.4
Clc 40	469	201	2.688	0.4

6.TESTING OF SPECIMEN

The testing are to be made on the prepared partial on the compressive testing machine and water absorption test.

6.1 COMPRESSION STRENGTH TEST

The entire load felt by the brick is its compression strength. The crushing strength of brick is typically characterized and determined by 215mm x 102.5mm x 65mm at an age of 7,14,28 days. It is the most common test on hardened brick because it is simple to execute and since most of the desired characteristics of brick are qualitatively connected to its compressive strength. For the casting of brick filled, a wooden mould constructed of Tee wood with dimensions of 215mm x 102.5mm x 65mm was utilized. To prevent leaks during casting, the mould and its base were securely damped together. The brick is then tested on a compression machine after 7, 14, 28 days of curing.

Fig 4: Compression Test on Block

Average Compressive strength = Avg. Load / Area of material

Table 5 :Readings of Compression strength

S.No	Material	Avg. Load on 7 days curing (KN)	Avg. Load on 14 days curing (KN)	Avg. Load on 28 days curing (KN)	Avg. Compressive Strength @7 days(N/mm2)	Avg. Compressive Strength @14 days(N/mm 2)	Avg. Compressive Strength @28ays(N/mm2)
1	Clc 0	295	462	702	21.11	33.06	50.23
2	Clc 10	321	474	712	22.97	33.92	50.95
3	Clc 20	387	520	742	27.69	37.21	53.09
4	Clc 40	352	515	718	25.19	36.85	51.38

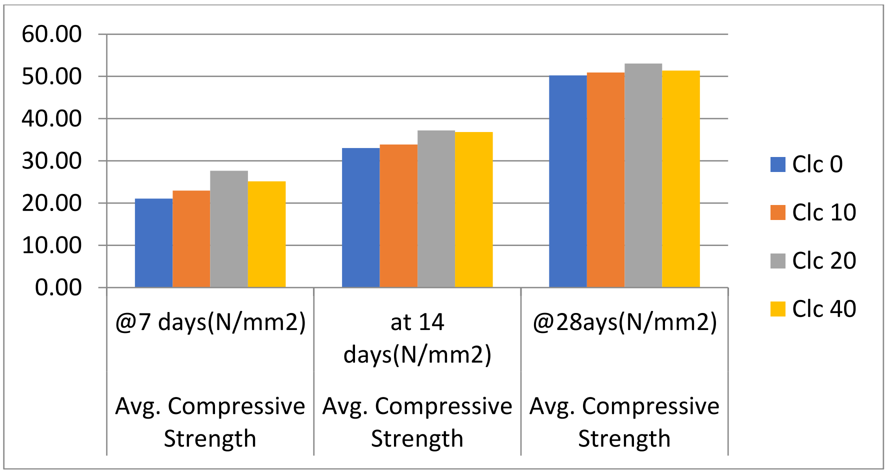


Fig 5: Graphical representation of compression test on 7, 14, and 28 days

6.2 WATER ABSORPTION TEST:

The water absorption test can be used to determine the hybrid material's absorption value. After 14 days of being removed from the farm, the average dry weight of brick specimens can be measured. The average weight of brick specimens after one day of immersion in water. For each brick specimen, the percentage of water absorption was assessed, which provided an indirect indication of durability. (Brick size:215mm x 102.5mm x 65mm)

Wet Weight – Dry Weight = Water Absorption Percentage

Fig 6: water absorption test

Table 6: Readings of Water Absorption

S.No.	Material	Dry Weight (Kg)	Wet Water Weight (Kg)	Water Absorption (%)
1	Clc 0	3.90	4.25	8.97
2	Clc 10	3.80	4.12	8.4
3	Clc 20	3.60	3.90	8.33
3	Clc 40	3.64	4.21	15.65

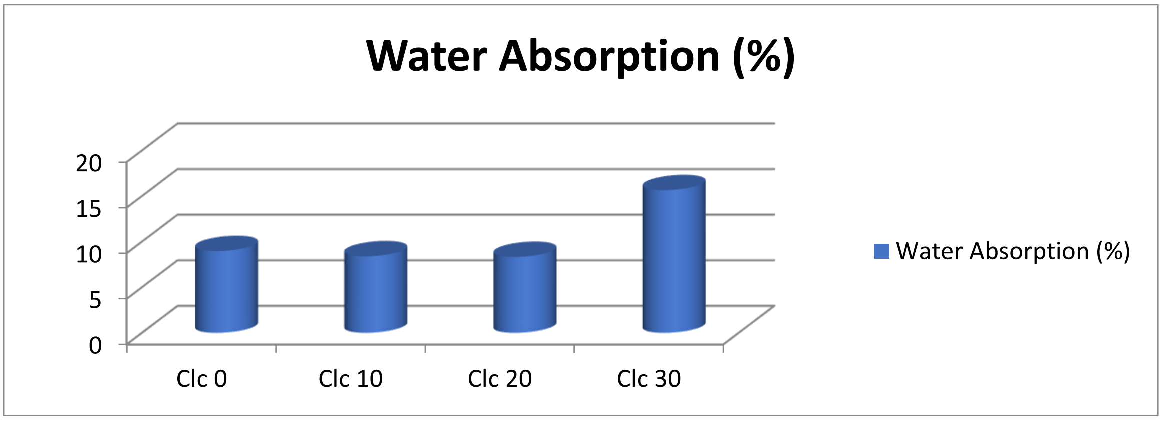


Fig 7: Graphical representation of water absorption test

6.3. FLEXURAL STRENGTH TEST:

Flexural strength is a material attribute defined as the stress in a material immediately before it yields in a flexure test. It is also known as modulus of rupture, bend strength, or fracture strength. The most common test is the transverse bending test, which involves bending a specimen with a circular or rectangular cross-section until it fractures or yields using a three-point flexural test procedure. The flexural strength of a material is the greatest stress it can withstand at the time of rupture. It's based on how much stress you're under. (Block size: 150mmx50mmx700mm)

Table 5.4 Readings of Flexural strength

S.No.	Material	Flexural strength(N/mm2) 7 days	Flexural strength(N/mm2) 14 days	Flexural strength(N/mm2) 28 days
1	CLc 0	3.84	5.22	7.13
2	Clc 10	4.51	6.71	7.68
3	Clc 20	4.82	7.06	7.94
4	Clc 40	4.15	5.81	7.21

Fig 8: flexural strength test

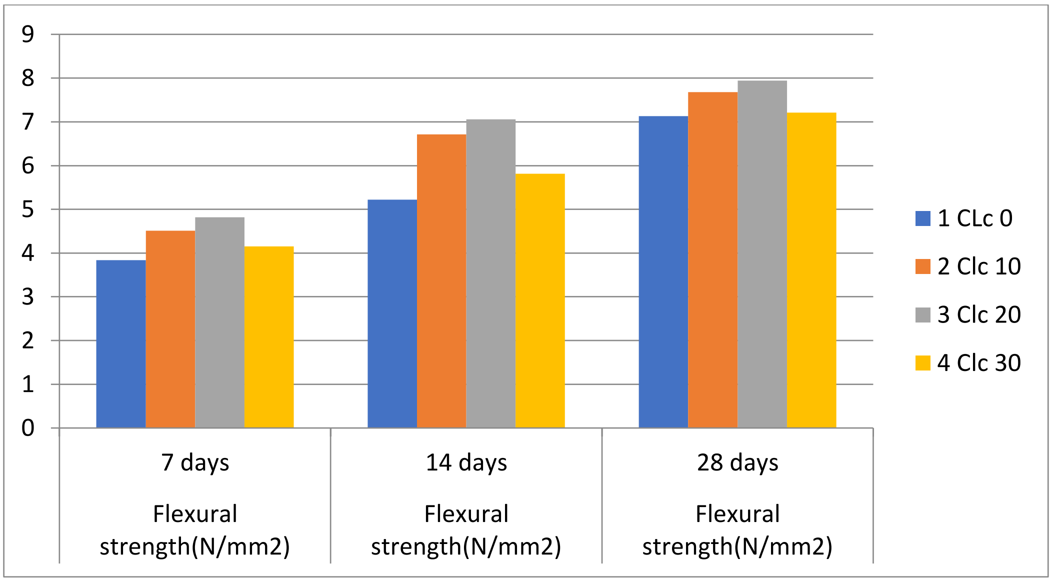


Fig 9: Graphical representation of flexural strength test

7. RESULTS AND DISCUSSION

7.1 RESULTS OF COMPRESSION TEST

From the research project which has been done, the findings obtained based on the test results, i.e. according to IS standards, can be seen in Table 5.1.

The different compositions studied included the use of 0%,10%,20%,40%ironite and have been added for testing and validation of new form of CLC brick. From the research conducted, it was found that the ironite powder composition affects the mechanical properties of CLC bricks.

The average compressive strength after 28 days is 50.23 to 53.09 MPa, where the highest compressive strength is found in the sample using 20% of ironite powder. The block with the lowest compressive strength was 0% of ironite powder which is conventional CLC brick.

7.2 RESULTS OF WATER ABSORPTION TEST

Using 40% of ironite powder absorbs more water than other blocks which is 15.65%. The lowest water absorption came from 20% of ironite powder. The remaining proportion is almost equal to 20% replacement.

7.3 RESULTS OF FLEXURAL STRENGTH TEST

Among all the four proportions, 20% usage of ironite improves the flexural strength of the CLC block which same as the above two tests. The least strength was given by the usage of 0% replacement.

8. CONCLUSION

This study indicates the effective utilization of ironite, fly ash has been developed and it made to use in the block.Various testing having been verified and concluded that ironite powder block cost comparison with other brick it is low and also its strength is high. Here by using this in this project various laboratory experiments were carried out on cellular blocks samples Some of them are Compressive strength study, water absorption study has been done and verified.

The results show that using 20% of ironite gives more compressive strength, flexural strength and absorbs less water among all the four proportions.

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