Hydrogel on Construction Brick

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Abstract **- Global temperature is getting increased day by day. There has been a drastic increase in the use of air conditioning system for cooling the buildings all around the world. The last decade has witnessed a severe energy crisis in developing countries especially during summer season primarily due to cooling load requirements of buildings. Increasing consumption of energy has led to environmental pollution resulting in global warming and ozone layer depletion. Here I am suggesting the concept of cooling bricks which can acts as a solution by reducing the indoor temperature up to 7°C.**

Index Terms **- air conditioning system, global warming, ozone layer depletion, cooling bricks.**

I.INTRODUCTION

The 'COOLING BRICK' project is a revolutionary change in the construction field. It is an innovative concept for future construction. This concept will decrease the temperature inside the building. The increase in the temperature is one of the major problem that we are facing every day, maximum at the time summer. On applying this idea, we can reduce the temperature up to 7 O C.

Fly ash brick is normally consisting of fly ash, soil, cement, and water. This brick is an unburnt brick which helps to increase the bearing capacity of brick. It is an environmentally friendly material which is alternative to clay bricks that is used in most of the residential construction in India. It can be used in all condition and in all temperature. But the only disadvantage is the weight of the brick will be more as compared to the clay brick and it cannot be used in high raised building. This idea will help people to reduce the temperature inside the building without spending extra amount on insulating materials.

II. OBJECTIVE

To reduce the temperature inside the building.

To study the compressive strength test, water absorption test, efflorescence test, and hardness test of the brick by adding different percentage of Hydrogel into the brick.

To study the cost of brick.

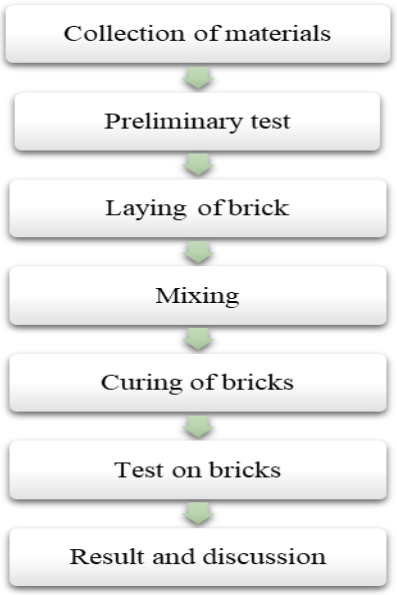
To make the bricks which are energy efficient which is the only variable solution to the environmental concerns and natural resources conservation for future generation.

III. SCOPE

This paper is made to study the engineering properties of brick, when hydrogel is added in different percentage as (5%, 7% and 9%) in terms of compressive test, water absorption test, efflorescence test and hardness test.

This paper helps to reduce using insulating material in the building, to reduce the temperature.

IV. METHODOLOGY



A. Collection of materials

The material required for manufacturing of cooling bricks are cement, fly ash, fine aggregate, and hydrogel.

a. Hydrogel

Hydrogel is a product which constitute of a group of polymeric materials, the structure which has a tendency in capable of holding large amounts of water in their 3-dimensional networks. It has been used for manufacturing many products that is used for many industrial and environmental purpose. It is also replaced with many other chemicals and material for using it in different condition so the new properties can also be found. It is very important to find new application of different products in different combination. The application of the hydrogel in different field is very high. Because of its water holding capacity. It can also reduce the temperature of the product. Many research is also going on hydrogel. In medical field it is very important product in their material like contact lens, etc. The water holding capacity will increase the lifetime of the hydrogel.

Fig.1 Hydrogel

b. Benefits of hydrogel on concrete

- Hydrogel Treatments Can Replace Multiple Products
- The curing agent
- The sealer, and
- The hardening / anti-dusting treatment
- Hydrogel Treatments are Equal to Water Curing
- Hydrogel Treatments are Environment (and People) Friendly
- Hydrogel Treatments Penetrate Deep
- Hydrogel Treatments are Compatible with Other Products.
- Hydrogel Treatments can be Used on Existing Concrete
- Hydrogel Treatments carry Warranties of up to 15 Years.

B. Preliminary test

The tests which are made to determine the engineering properties of the material, which is used to manufacture of fly ash brick. The tests are consistency test, initial setting and final setting test for cement, specific gravity and sieve analysis for sand, density, compressive strength, and degree of water swelling for hydrogel.

a. Cement

Table.1 Properties of Cement

Test conducted	Observation	Standard Value
Consistency	32 %	25-35% (IS 4031-1988 Part IV)
Initial setting time	31 min	30 min (IS 4031- Part V)
Final setting time	600 min	10 hrs (IS 4031- Part V)

b. Fine Aggregate

Table.2 Properties of Sand

Test conducted	Observation	Standard Value
Specific gravity	2.73	2.5-3.0 (IS:2386 – Part III) – 1963
Sieve analysis	Cu > 4 1 < Cc < 3 Well graded soil	IS:383-1970

c. Fly ash

Table.3 Properties of Fly ash

Properties	Standard Value
Specific gravity	2.02
Liquid limit	26.8 %
Max. Dry density	12.86 KN/m^3
Optimum moisture content	23 %
pH	9.76

d. Hydrogel

Table.4 Properties of Hydrogel

Properties	Standard Value
Density	19 – 56 mol/m^3
Compressive strength	0.43 MPa
Degree of water swelling	280 – 870 %

C. Laying of Bricks

We have many process in manufacturing of Hydrogel brick and they are batching, mixing, and molding.

a. Batching

Batching refers to separating, transporting, and weighing of the required material for making the brick. It should be regularly checked/verified at every day.

b. Mixing

Mixing is a very important process; the uniform mixing will make the bricks in a uniform property and strength.

Fig. 2&3 Mixing

c. Molding

It is one of the important steps in manufacturing the fly ash brick. It is used for making the brick in perfect shape and size so proper finishing will be made. The mixing should be uniform if not the brick will not be able to carry the load uniformly and the strength of the will not be uniform throughout the brick. The molding will make the brick in standard size and it is done in machine because the hand molding will not give much pressure in it, so machine will provide much pressure up to 150 – 200 kg/cm2.

Fig.4 Molding

d. Curing

Bricks shall be air dried for 1-2 days. Thereafter, air dried bricks should be water cured for a minimum period of 14 days. Curing is carried out by sprinkling water manually or by any other means. It is recommended that the curing period may be extended during cold/wet weather. strength increases with increase in density irrespective of lime content, type of curing and molding water content.

Fig.5 Cooling Brick

V. TEST ON BRICKS

A. Compressive Strength Test

No. of Trials	7 Days	14 Days	21 Days
1	2.44	3.61	7.16
2	2.52	3.65	7.34
3	2.40	3.57	6.98

Table.5 Compressive strength of Cooling bricks

No. of Trials	7 Days	14 Days	21 Days
1	1.98	3.95	7.91
2	1.68	3.36	6.78
3	1.81	3.43	6.97

Table.6 Compressive strength of Normal fly ash bricks

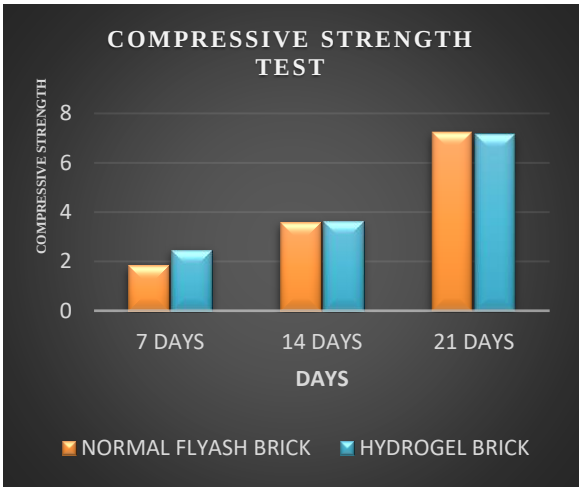


Fig.6 Comparison of Compressive strength of normal fly ash brick VS cooling brick

B. Water Absorption Test

S. No.	Dry Weight W1	Wet Weight W2	% of Water Absorption
1	3136	3543	12.97
2	3162	3598	13.78
3	3064	3570	16.52

Table.7 Water absorption of Cooling brick

S. No.	Dry WeightW1	Wet Weight W2	% of Water Absorption
1	3148	3504	11.30
2	3127	3531	12.92
3	3164	3557	12.42

Table.8 Water absorption of Normal fly ash brick

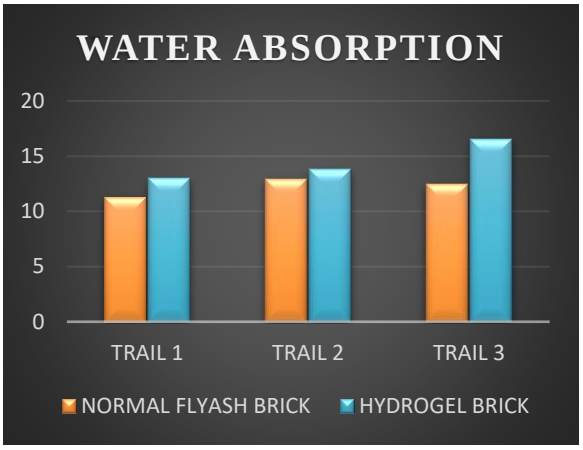


Fig.7 Water absorption of normal fly ash brick VS cooling brick

C. Efflorescence Test

Nil: When a salt deposit is imperceptible, then it said to be Nil.

Slight: When efflorescence does not cover more than 10% of the exposed area of the bricks, it is said to be slight.

Moderate: When a deposit of efflorescence is heavier than slight and does not cover more than 50 percent of the exposed area of the brick surface. There should not powder or flake of the brick exposed surfaces.

Heavy: When the deposit covers an area of 50 percent or more of the exposed area of the brick surface. Then it is said to be efflorescence salts are heavy. There should not powder or be flaking of the brick exposed surfaces.

Serious: efflorescence is said to be serious when there is powdering or flaking of salt on the exposed surface of bricks.

RESULT: The efflorescence is obtained as Nil for Cooling Brick as per IS 3495 – 1992 Part III.

D. Hardness Test

Hardness Test is a simple test. A good brick is more resistance to abrasion. Sharp object scratches the surface of bricks and if there is no impression on brick then it's a Hard Brick. The hardness of brick can be judged with the help of the scratch of the fingernail. Try to scratch figure on brick, if no scratch is left on the surface of the brick, it is considered to be having sufficient hardness.

Fig.8 Hardness test

VI. CONCLUSION

Normal fly ash bricks can be replaced by hydrogel bricks. Hydrogel is the material used in the brick which act as a cooling agent. Due to its moisturizing character it is widely used in manufacture of contact lens, wound dressings, nappies, etc. The advantage of using hydrogel brick is that it absorbs the moisture present in the atmosphere during nighttime and evaporates those water present inside the wall at day as the temperature gets increased. This helps in keeping the room cool by reducing the temperature on the other hand all properties of fly ash brick and hydrogel brick are same other than water absorption. The hydrogel brick absorbs more water than the fly ach brick, which is a great advantage. Thus, hydrogel bricks can be used in place of fly ash bricks. Where the temperature gets reduced up to 7o C from the current temperature.

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