

Laboratory Study on Self Healing Concrete Pavement

Prerana K⁽¹⁾, Rajrajeshwari G⁽²⁾, Ranjitha B R⁽³⁾, S K Vidyashree⁽⁴⁾,
Dr Shiva Kumar G⁽⁵⁾

^{*(1,2,3,4)} Final year UG student, Department of Civil Engineering, Dayananda Sagar College of Engineering, Bengaluru

^{*(5)} Assistant Professor, Department of Civil Engineering, Dayananda Sagar College of Engineering, Bengaluru

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ABSTRACT : Concrete could be a variable material having several advantages. thus it's the foremost wide used material within the housing industry. Several researchers made an attempt to use waste materials with the target of eliminating the disposal issues and at constant time up the properties of concrete.

Self-healing concrete has gained a lot of importance within the current state of affairs. Deterioration is unavoidable though innovations square measure streaming within the field of concrete technology. Admixtures return handy in the economic purpose of reading for achieving self healing in concrete structures thus on scale back the cracks within the earlier stage itself.

Self-healing technology could be an important field at intervals material technology. It represents a revolution in materials engineering and is dynamically the means that materials behave. Integrating self healing technology into the road style method has the potential to rework building and maintenance processes by increasing the period of time of roads and eliminating the necessity for road maintenance.

Keywords: Pavement, self-healing, fiber reinforcement, fly ash, activated charcoal, compressive strength, pre-loading, crack healing, durability

I. INTRODUCTION

Conventional roads have a lifespan of 5-10 years and need maintenance from time to time. thanks to significant rains and climatic conditions roads deteriorate simply making cracks and potholes. Village roads can't be maintained properly. Then to extend the steadiness of pavement, self-healing techniques came to follow.

Self-healing concrete could be a concrete with a capability to repair its own cracks and imperfections while not external designation or

human intervention. Product period could be a vital issue that ought to be maximized, particularly in road works whereas virtually everybody enjoys the gap of a brand new road that would minimise required time off their commute, and nobody likes to repair them. Roads square measure failing and the government cannot sustain with the repairs. The roads would require minimum mating, increasing productivity whereas decreasing value.

Unlike the standard Rigid Pavement during which cement could be a important element, in self-repairing road it uses eightieth Cement a pair of and a couple of and a pair of }0% Fly-Ash And 2,3,4% Activated Carbon. These materials on constituent with cement a

activated charcoal makes a standard grade concrete as High Strength and High Performance Concrete. The maximum content that self heals the road is fibers. The Fibers getting used in constructing self-healing road, ought to have a synthetic resin and international organization hydrous cement attracts water within the event of rains. The water then becomes a vital element in healing cracks.

Fiber-reinforced concrete is good for up the sturdiness and toughness performance of concrete and mortar. Fibers in concrete facilitate scale back shrinkage cracks, increase strength, increase energy absorption and scale back dangerous spalling at high temperatures.

II. MATERIALS USED

- **Fly ash:** Flyash is utilised as a supplementary building material material (SCM) within the production of hydraulic cement concrete. A supplementary building material once utilised in conjunction with hydraulic cement contribute to the properties of the hardened concrete. Gift days construction industries want quicker development and additionally

need high strength of concrete to facilitate the quick and economic construction. This demand of high early strength gain of concrete places forth the utilization of low w/c magnitude relation.

- **Aramid fibers:** are organic polymer fibers synthesized by spinning the product of the constituent chemical solutions, and like the other fibers that have been described so far, it comes in different grades with a fiber diameter of around 10 μm . Since it is a polymeric fiber it has low density compared with other comparable fibers and therefore high specific properties.

- **Activated carbon:** Activated carbon, additionally known as carbon, could be a kind of carbon processed to own little, low-volume pores that increase the extent. The Activated Carbon in the Concrete can increase the compressive strength obviously and scale back the pores in the rigid pavement.
- **Epoxy resin :** Epoxy resin is an ideal sealant for concrete surfaces since it allows extremely strong bonds with concrete. If you coat your concrete surface with epoxy resin, you will achieve the perfect combination of a minimalist industrial look and ideal surface properties.



Fig-1 : Materials collected

III. OBJECTIVE

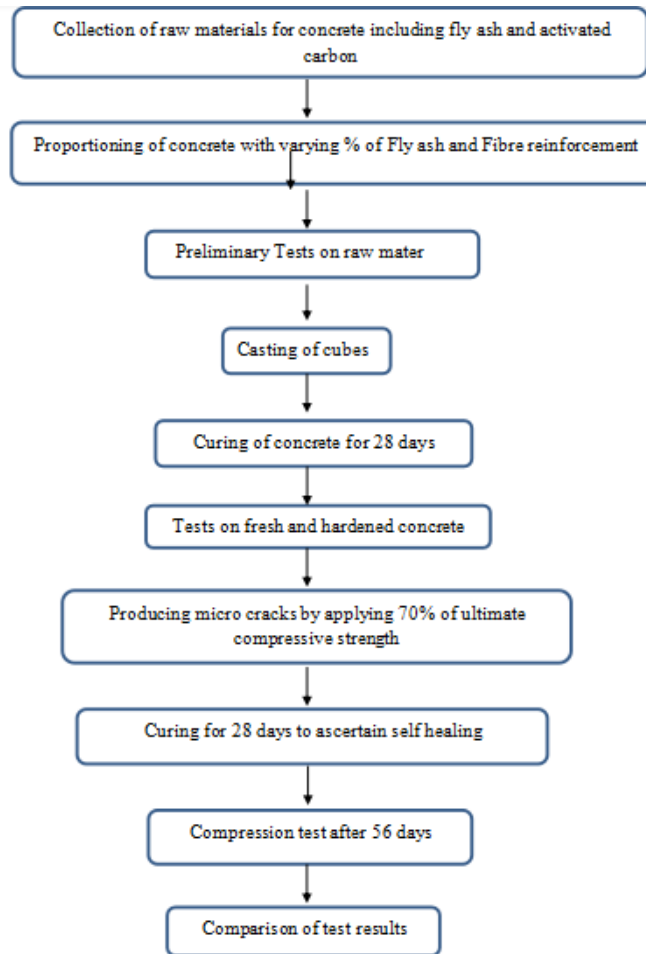
- To evaluate the mechanical properties of concrete containing activated carbon, fly ash and fibers.
- To evaluate the workability of concrete.
- To carry out compression and split tensile test
- To compare the results of self healed concrete with conventional concrete.

IV. METHODOLOGY

The experiment is started with the gathering of raw materials that are needed for the physical phenomenon of the experiment. The raw materials are cement, fly ash, coarse combination, fine combination, carbon, fiber and water. to check the self-healing behaviour of concrete, cubes ought to be ready with varied proportion of fiber reinforcement.

Preliminary tests like sieve analysis, wet content check, sieve analysis check, etc are conducted on the raw materials to grasp their physical and mechanical properties. Concrete cubes of M-40 concrete are casted with varied proportions fiber reinforcement.

After solidification for twenty eight days, the cubes are tested for compressive strength, strength, flexural strength and unhearable pulse speed tests from 7-28 days to assess the mechanical properties of typical concrete. 70-80% of compressive strength applied to created small cracks. to establish the self-healing method the cubes are cured for one more twenty eight days. when solidification, the strength tests are conducted once more. each the check results are compared, studied and analyzed.



V. MIX PROPORTION

M40 Design mix

cement	Fine aggregates	Coarse aggregates	W/c ratio
1	2.56	3.25	0.4

With addition of fiber in the ratio 1%, 1.5%, 2%
 20% of flyash is used as the replacement of cement
 3% of activated carbon has been added as the volume of the cement.



Fig-2: Casted cubes

VI. COMPRESSION TEST

Table-1 : Compression test for hardened concrete with activated carbon, fly ash and fibre.

Percentage of fibre reinforcement	14 days compressive strength	28 days compressive strength
Conventional concrete mix	30.62N/mm ²	38.96 N/mm ²
1%	34.14 N/mm ²	40.78 N/mm ²
1.5%	36.07 N/mm ²	44.96 N/mm ²
2%	38.32 N/mm ²	48.52 N/mm ²



Fig-3 : Compressive Strength

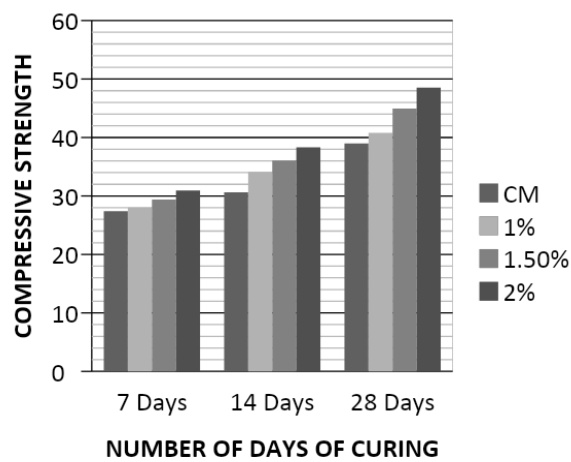


Chart -1 : Compressive Strength

VII. SPLIT TENSILE TEST

Table -2 : Split tensile test for hardened concrete with activated carbon, fly ash and fibre.

Percentage of fibre reinforcement	14 days compressive strength	28 days compressive strength
Conventional concrete mix	4.01 N/mm ²	5.41 N/mm ²
1%	18.61 N/mm ²	26.03N/mm ²
1.5%	19.23 N/mm ²	27.82 N/mm ²
2%	20.07 N/mm ²	28.97 N/mm ²



Fig-4: Tensile Strength

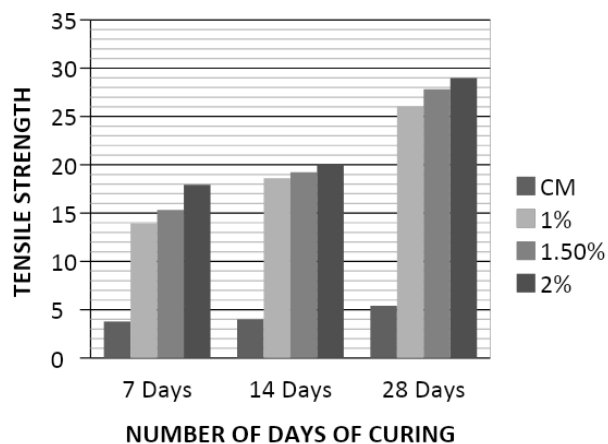


Chart – 2 : Tensile strength

VIII. CONCLUSION

- Compressive strength increases with increment in level of aramid fiber supplanted with 0.5%, 1%, 1.5 % of volume of cement
- Split tensile strength increases with increment in level of aramid fiber supplanted with 0.5%, 1%, 1.5 % of volume of cement.
- Due to the addition of activated carbon, there is an increase in compressive strength and pores are reduced.
- Addition of fly ash increases workability and reduces formation of crack width Increase durability.
- Fiber with hydrophilic coating have natural tendency to self repair crack that are formed

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