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EXPERIMENTAL STUDY ON SELF-HEALING OF RIGID PAVEMENTS

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Abstract - This paper majorly focuses on the application of Self-healing of Rigid pavements and its sustainability. It is built using ultra high strength concrete and special fibers, it is not only cost-effective, but has greater longevity. Unlike the typical Rigid Pavement in which cement is a key component, in self-repairing road it uses 80% Cement And 20% Fly-Ash and 5 % Activated Carbon & 2.5 % of Fibers. These materials on constituent with cement and Activated Carbon makes a normal grade concrete as High Strength and High Performance Concrete. The main content that self heals the Pavement is fibers. The Fibers being used in constructing self- repairing Pavement, should have a epoxy resin and un hydrated cement attracts water in the event of rains. The water then becomes a key component in healing cracks. When a crack appears, this water gives hydration capability to the un- hydrated cement, and produces more silicates, which actually close the crack before they grow larger. The total number of cubes were casted for this project for Compressive Strength for 7, 14, 28 days are 12 cubes, In which 3 are Conventional concrete, 3 cubes were made with 5% of Activated Carbon, 3 cubes were 2.5% of Fibers, 3 cubes were made with 5 % of Activated Carbon & 2.5% of Fiber. The total number of cylinder were casted for this project for Split Tensile Strength for 7, 14, 28 days are 12 Cylinders, In which 3 are Conventional concrete, 3 Cylinders were made with 5% of Activated Carbon, 3 Cylinders were 2.5% of Fibers, 3 Cylinders were made with 5 % of Activated Carbon & 2.5% of Fiber. Additionally 3 moulds with 100 mm thickness with 5% of Activated Carbon & 2.5% of Fibers & 5% of Epoxy Resin were prepared for Generation of crack and Healing of Crack at 7, 14, 28 days. The road is about 100mm thick, which makes it 50 % to 60% less thick than the standard Indian road. This makes the first-time cost of laying out such a road about 20% to 30% cheaper.

Key Words: Rigid pavement, Cement, Concrete, Fibers, Fly-Ash, Activated Carbon, Water, Rain, Epoxy Resin, Self-Healing, Compressive Strength, Split Tensile Strength.

1. INTRODUCTION

Self-healing technology is a new field within material technology. It represents a revolution in materials engineering and is changing the way that materials behave. Incorporating self-healing technology into the road design process has the potential to transform road construction and maintenance processes by increasing the lifespan of roads and eliminating the need for road maintenance. By decreasing the unnecessary premature ageing of rigid pavements, self-healing asphalt can reduce the amount of natural resources used to maintain road

networks, decrease the traffic disruption caused by road maintenance processes, decrease CO2 emissions during the road maintenance process and increase road safety. In addition to environmental savings, self-healing materials have the potential to deliver significant cost savings for road network maintenance.

Concrete structures often suffer from cracking that leads to much earlier deterioration than designed service life. To prevent such deterioration, regular inspection of cracks in concrete structures and their repair are usually carried out by means of some kind of human intervention.

The roads will require less servicing, increasing productivity while decreasing cost. Self-healing roads far outperform conventional roadways, self-healing Rigid Pavement can improve traffic flow, reduce maintenance activity, and can easily extend the life of a road up to 40 years. Durability is experiencing a shift from the idea of minimizing damage to the new era of self-healing capabilities.

OBJECTIVE

- To test and lay high strength concrete road 5% of activated carbon, 20% fly ash and cement content 80%. The presence of Activated carbon & Fibers in concrete increases the strength of the road to 15-30% compared to conventional concrete.
- To give secondary reinforcement for the high strength concrete road with Steel and coir fibers.
- To induce the concept of self-repair when crack are formed with polar substances natural and Synthetic Fibers.
- To increase the life span of the road and durability when compared to normal asphalt and cement roads.
- To increase the Compressive strength and Split Tensile of the rigid pavement by adding Activated Carbon and Fibers which will increase the strength by 15-30% compared to conventional concrete.

MECHANISM

- The Activated Carbon in the Concrete will increase the compressive strength evidently and reduce the pores in the rigid pavement. This will significantly resist the road from cracks.