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INVESTIGATION ON SELF HEALING CONCRETE USING EPOXY RESIN

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Abstract – *Concrete is very sensitive to crack formation as wide cracks endanger the durability, repair may be required. However, these repair work raise the life cycle cost of concrete as they are labor intensive and because the structure becomes in diffuse during repair. In 1994 C. Dry was the first who proposed the intentional introduction of self healing properties in concrete. Self healing approaches offer a solution to repair these damages automatically. Healing agents are commonly encapsulated in container such as glass tubes or capsules. In this project work encapsulated epoxy resin was added to the specimen. This can be improved through the addition of microencapsulated healing agents for automatic self healing.*

***Key Words*: glass capsules, epoxy resin, encapsulation...**

1. INTRODUCTION

It is well known that one of the weaknesses of concrete is its vulnerability to cracking. Crack may occur when concrete is in a plastic state or after it has completely hardened. Concrete may crack due to plastic shrinkage, weathering, and corrosion of reinforcement or due to applied loading. Concrete has low tensile strength and therefore concrete constructions are often combined with various type of reinforcement to resist tensile stresses. Although this is a measure to control concrete cracking, complete crack prevention is almost impossible. For example reinforcement act as local restraint against free shrinkage when concrete is in a plastic static, causing settlement cracks to form. Such occurrence may lead to more adverse problems such as spalling and even premature structural failure. Self healing capabilities are achieved by the release of healing material from the agent as a result of cracking from the onset of damage. When crack happens the agent containing self healing compounds within the concrete material break and the healing agent is released to heal the crack.

1.1 MATERIALS

1.1.1 CEMENT

Cement acts as a binder to join the aggregate into a solid mass. It is one of the most important constituent of concrete. Portland pozzolano cement with normal consistency was used in concrete.

1.1.2 M-SAND

M-Sand is crushed aggregates produced from hard granite stone which is cubically shaped with grounded edges, washed and graded with consistency to be used as substitute of river sand because of lack of availability of river sand. M-sand is preferably using for construction activities.

1.1.3 COARSE AGGREGATE

Aggregate are inert granular materials such as sand, gravel or crushed stone that along with water and Portland cement are essential ingredients in concrete. For a good concrete mix aggregates need to be clean, hard, strong particles free of absorbed chemicals or coatings of clay and other fine materials that could cause the deterioration of concrete.

1.1.4. WATER

Water is the key ingredient which, when mixed with cement forms a paste that binds the aggregate together. The water causes the hardening of concrete through a process called hydration. Water also required triggering polymerization action when epoxy resin comes in contact with water so that crack can be bond together.

1.1.5 EPOXY RESIN

Epoxy resin is a usually thermosetting resin made by copolymerization of epoxies with another compound having two hydroxyl groups and used chiefly in coatings and adhesives.

1.1.6 GLASS CAPSULES

Glass balls are dimensionally stable, resist corrosion and chemical absorption and can withstand high temperatures. Density varies depending upon the type glass used to manufacture the ball.

1.2 EXPERIMENTAL WORK

Concrete samples were prepared with M_{25} grade of concrete cube with 150*150*150 mm dimension.