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IMPROVEMENT OF ABRASION RESISTANCE OF CONCRETE FLOORS

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IMPROVEMENT OF ABRASION RESISTANCE OF CONCRETE FLOORS

A thesis submitted for the partial fulfillment
of the Degree of Master of Engineering in
Structural Engineering Design

Submitted By
G.M.Thilakarathne
September 2007

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ABSTRACT

In the development process reinforced concrete played an important role as a very satisfactory construction material because of durability. An application of reinforced concrete has reached a very advanced stage both in design and construction techniques. Reinforced concrete has been successfully used in horizontal and vertical structures in construction of buildings, bridges, roads, vehicle parks, pavements, dams, bunkers, silos, water retaining structures and many other structures.

Cover-crete of concrete has been defined as the concrete outside of the reinforcing bars. The cover-crete is mainly used for resistance to damage by fire and to protect the reinforcements from buckling and twisting at higher temperature. It also offers very good resistance to adverse atmospheric conditions and prevents reinforcements from corrosion. Past researchers have conducted experiments to improve the cover-crete properties with an aim to improve the previously discussed points.

Due to applied loads, cover regions some times have been subjected to tensile and bending stress. Due to poor tensile strength of concrete in general, cover-crete may have a cracked region thereby exposing the embedded reinforcing steels. However, except in most severe situations, cover-crete always provide a satisfactory service.

The research was conducted to formulate a economical and repeatable method for treatment of cover-crete in general usage and rehabilitation of decayed cover-crete too.

Experiment Study was carried out to observe the improvement of cover-crete by introducing fibres to concrete mix. Variable parameters are concrete grade, fibre length, fibre percentage and fibre type. In this experiment grade 20 concrete was used in order to model the practical situation as close as possible. Fibre length was limited to 25 mm and fibre percentage was limited to 5 % by volume. Fibre types were natural (coconut fibre), synthetic (nylon), steel (wire mesh).

In the first trial of the experiment, eight numbers of specimens of 300 mm x 250 mm x 250 mm dimensions and ten numbers of test cubes of 150 mm x 150 mm x 150 mm dimensions were casted having 100 mm fibre concrete layer on the top of the eight specimens under the category of normal concrete, wire mesh concrete, coconut coir fibre concrete and nylone fibre concrete. Specimens were tested for compressive strength and abrasion resistance while applying horizontal and vertical forces simultaneously. Available machine was modified to test the abrasion of specimens. Same process was repeated for second trial too.

Comparative analysis were done between the results of non fibrorous specimen (without fibre) and fiborous specimens (with nylon, coir and steel fibre). Fiborous specimen performed better than non fibrorous specimens. Among the fiborous specimens, best performance for abrasion resistance was given by nylon fibre reinforcement and second best performance was given by coconut fibre reinforced concrete specimen.

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ABBREVIATIONS

ACI	-	American Concrete Institute
AR - Glass	-	Alkali Resistance Glass
BC	-	Before Christ
E-Glass	-	Electrical Glass
FRC	-	Fibre Reinforced Concrete
GPa	-	Gega Pascal
HM	-	High Modulus
HS	-	High Strength
MPa	-	Mega Pascal
PAN	-	Polyacrylonitrile
S-Glass	-	Higher Stiffness and Strength Glass