

Study of Mechanical Properties and Durability of Roller Compacted Concrete Pavements Reinforced by TRC Composite in Magnesium Sulfate Environment

Hasan Pasdarzadeh

h.pasdarzadeh@cv.iut.ac.ir

September 24, 2012

Department of Civil Engineering

Isfahan University of Technology, Isfahan 84156-83111, Iran

Degree: M.Sc

Language: Farsi

Supervisor: Morteza Madhkhan

Email address: madhkhan@cc.iut.ac.ir

Abstract

Roller compacted concrete is such as a concrete with zero slump that is compacted by rollers. Nowadays, it is increasingly utilized for pavements of concrete roads. Reinforcing this concrete with armature is impossible due to a lot of limitations. For this reason, researchers have been always about to find a method for improving ductility and flexural resistance. Using a layer of fine grained concrete that reinforced by glass fiber textile (T.R.C), on the tensile side of the roller compacted concrete increases the ductility and flexural resistance of the roller compacted concrete noticeably. T.R.C is a composite that includes two parts. The first part is the concrete with fine grain and second one is knitting glass fiber textiles. Performance of roller compacted concrete that reinforced with this composite firstly depends on bonding between textile and fine grained concrete in the T.R.C and secondly depends on the bonding between T.R.C and roller compacted concrete under imposed forces. In this research, Mechanical Properties and Durability of Roller Compacted Concrete Pavements Reinforced By TRC Composite have been Studied. Durability of Roller Compacted Concrete that Reinforced with this Way Investigated in 5% Magnesium Sulfate solution.

Knitting glass fiber textiles are resistant against alkaline environments and fine grained concrete is used with different pozzolanes including metakaoline and silica fume.

The soil method was used to find the mix design of roller compacted concrete in pavement. For compacting concrete, the kango vibrating hammer has been used. Required optimum moisture value for mix design and finally the mix design of RCCP was obtained. Construction of experimental specimens had two phases. At the first phase, the TRC was placed at bottom of the mold and at the second one, the RCCP was compacted on it. The specimens used in this research have prismatic shapes with dimension of 100*100*350 mm and experimental test on specimens is 4-points toughness test according to ASTM C1018 standard. Results show that reinforcing roller compacted concrete by TRC improves the mechanical Properties of roller compacted concrete. Rupture modulus and ultimate deflection increase 53 and 101 Percent respectively.

Specimens show high resistance against magnesium sulfate environment in different times. Using silica fume and metakaoline in fine grained concrete in TRC for reinforcing roller compacted concrete with this composite improved the durability and flexural performance of roller compacted concrete.

Key words:

Roller compacted concrete, TRC, fiber glass textile, fine grained concrete, silica fume, metakaoline, 4-pointed toughness test.

