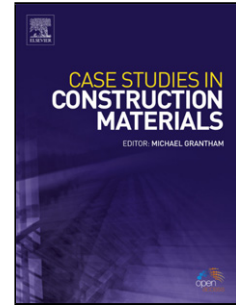


Accepted Manuscript

Title: Rubber Concrete: Mechanical and Dynamical Properties

Authors: Najib N. Gerges, Camille A. Issa, Samer A. Fawaz

PII: S2214-5095(18)30184-0
DOI: <https://doi.org/10.1016/j.cscm.2018.e00184>
Reference: CSCM 184



To appear in:

Received date: 12-6-2018
Revised date: 6-7-2018
Accepted date: 9-7-2018

Please cite this article as: Gerges NN, Issa CA, Fawaz SA, Rubber Concrete: Mechanical and Dynamical Properties, *Case Studies in Construction Materials* (2018), <https://doi.org/10.1016/j.cscm.2018.e00184>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Rubber Concrete: Mechanical and Dynamical Properties

Najib N. Gerges, Camille A. Issa, Samer A. Fawaz

Najib Gerges is a Professor at the University of Balamand, el-Koura, Lebanon (e-mail: najib.georges@balamand.edu.lb).

Camille Issa is a Professor at the Lebanese American University, Byblos, Lebanon (e corresponding author e-mail: cissa@lau.edu).

Samer A. Fawaz is a Ph.D. candidate (e-mail: samer_fawaz@hotmail.com)

Abstract — The purpose of this paper is to report on an experimental study that explores the effect of using recycled rubber powder as an alternate fine aggregate in concrete mixes. Natural sand in the concrete mixes was partially replaced by 5%, 10%, 15%, and 20%. Physical properties such as the density, the compressive strength, the fresh concrete properties, the split-tension, and the impact load capacity are examined. The results revealed a decrease in the compressive strength of concrete cylinders containing rubber. The dynamic performance of the rubber concrete is of high importance because of its high resilient nature, as the rubber particles that are included in the concrete have a positive effect on the dynamic performance. The conclusions that were derived from this research implicate potential applications where rubberized concrete can be efficiently used. Even though rubberized concrete mixture generally has a reduced compressive strength that may limit its use in certain structural applications, it possesses a number of desirable properties, such as lower density, higher toughness, and higher impact resistance compared to conventional concrete.

Keywords—Rubberized Concrete; Compressive Strength; Splitting Tensile Strength; Impact Load.

I. INTRODUCTION

Countries and cities have been faced with major increasing problems with the disposal of recycled materials, such as rubber, glass, and plastics for several years. The consumption of the world's rubber has nearly reached 24.9 million tons in year 2010. In the U.S. alone, approximately 3.9 million tons of scrap tires are produced every year, out of which 1.36 million tons are recycled and 2.54 million tons are burned or land-filled. In view of the wide and vast market for scrap tires, about a quarter of all scrap tires end-up in landfills numbering to approximately 27 million tires or roughly 6 million tons annually, making-up over 12% of all solid waste. The disposal of the scrap tires materials become very costly once they are sent to landfills; not to mention the wide space that they use in landfills to dispose of, and the hazard that they cause towards the environment. Based on this information, the rubber use in concrete and pavement material provides an environmentally sustainable method for disposing of the millions of tires that are annually generated.

Powdered rubber is a general term or an expression given to recycled rubber that is generated from scrap tires. The production of powder rubber consists of removing the steel and fluff, then using a granulator and/or cracker mill, with the aid of cryogenics or mechanical means, in order to reduce the size of the tire particles.

A well-known fact is that tires can be divided into two major groups: automobile tires and truck tires, and they are different from each other. The description of the rubber source is very important and should always be specified in the literature because it has an influence on the texture and the shape, and consequently, on the characteristics of the concrete that is adjusted by the addition of the specified percentage of the rubber. It is also important to point out that automobile tires and truck tires vary not only in shape, weight and size, but above all, in the ratio of the components of the base mixture. Researchers have considered three wide categories of discarded tire rubber concrete mix design:

1. Chipped Rubber: This type of rubber has dimensions of about 25 to 30 mm and used to replace the coarse aggregates in concrete.
2. Crumb Rubber: The particles of rubber are highly irregular, varying between 3 to 10 mm, and are used to replace the fine aggregates.
3. Powdered Rubber: The particles of the rubber are smaller than 1 mm and consist of the powder formed during the crunch process, fallen from the machinery of the plant that is handling the waste rubber. This type of rubber could be used as filler in concrete due to its size.

Download English Version:

<https://daneshyari.com/en/article/6701712>

Download Persian Version:

<https://daneshyari.com/article/6701712>

[Daneshyari.com](https://daneshyari.com)