SUITABILITY OF APPLYING TREATED WASTEWATER IN REINFORCED CONCRETE MIXING AND CURING

A Thesis
Submitted to the Faculty of Engineering
Ain Shames University for the Fulfillment
of the Requirement of M.Sc. Degree
In Civil Engineering

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Dedication

This thesis is dedicated to every person who guided me through my journey in life and helped me be what I am today.

A special dedication to

My supportive Parents

And to

My dear Wife

And finally
Special dedication to my dearest person

My Grandmother

Thank you for encouraging me to complete this work and for always being there for me.

STATEMENT

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of M.Sc. in Civil Engineering.

The work included in this thesis was carried out by the author in the department of Public Works, Faculty of Engineering, Ain Shams University, from October 2015 to September 2018.

No part of the thesis has been submitted for a degree or a qualification at any other University or Institution.

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

Date: - 23/2/2019

Signature: - ----------------

Name: - ***HUSSEIN MAHMOUD AHMED EL-GHORAB***

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ABSTRACT

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Abstract: -

The objective of this thesis is to study the effect of using treated wastewater in mixing and curing of concrete to identify the suitability of its usage. The problem is that potable water is considered to be scarce in many of the world's countries and finding applications for treated wastewater reuse is very effective in preserving potable water resources.

The thesis compares the concrete properties for specimens mixed and cured by three different types of treated wastewater which are primary, secondary and tertiary treated wastewater to that for specimens mixed and cured by potable water.

The concrete properties included in the study were: (Setting time, compressive strength, tensile strength, bond strength, abrasion, density, absorption, voids, sorptivity, sulfate attack, and corrosion probability), and these properties were assessed since the time of mixing till concrete age of 180 days.

The results show that it is possible to use treated wastewater in mixing and curing of reinforced concrete with some concerns that differ for each treated wastewater type, where some concrete properties included in the study are relatively lower than that of using potable water with the increase of organic materials in the treated wastewater.

SUPERVISORS

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KEY WORDS

Treated Wastewater, Concrete Mixing, Concrete Curing.

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CHAPTER I
INTRODUCTION

1.1 BACKGROUND

Fresh water scarcity is considered a major problem worldwide, where sources of fresh water are diminishing as a result of pollution or climatic changes. Therefore, most countries with fresh water scarcity seek methods to reduce fresh water consumption on public and industrial scale.

Treated wastewater reuse has been a rapidly growing field worldwide as the whole international community is adopting sustainabilty measures in order to insure perserving of fresh water scarce resources, where it is common nowadays to find treated wastewater reuse applications in almost all water consuming fields, such as agriculture, landscaping, industrial applications, ground water replenishing and many other fields.

Recent researches in the treated wastewater reuse seek extending the fields where treated wastewater reuse is applied, by discovering other applications where reuse is feasible. These applications that are targeted usually requires a lower quality of water as the cost of wastewater treatment is kept a very important aspect in treated wastewater reuse.

1.2 STUDY OBJECTIVE

The main target of the thesis is to study the effects of using treated wastewater in the concrete industry as both mixing and curing water as an alternate to potable water, in order to assess the suitability of using such water in plain and reinforced concrete applications.

This study is aiming to find the limitations of concrete mixed and cured using several types of treated wastewater with different levels of treatment (Primary, Secondary, Tertiary) by assessing a variety of critical concrete properties when compared to conventional concrete mixed and cured using potable water.