The Potential Use of Crumb Rubber in Hot Asphalt Mixes in Egypt Using Dry Process"

A Thesis

Submitted to the Public Works Department

Faculty of Engineering

Ain Shams University

For partial Fulfillment for the Requirements of

The Master of Science Degree

In Civil Engineering (Highways and Traffic)

Prepared by

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B.Sc. in Engineering, 2013

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DEDICATION

This work took tremendous effort to do it. I wish to dedicate it to who suffered to support and help me to finish this work,

TO MY MOTHER, FATHER and MY WIFE

Also, I wish to dedicate my thesis

to my brothers and my sisters

for their encouragement and help to complete this work.

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Statement

This thesis is submitted to Ain Shams University, Faculty of Engineering, and Public works department for the degree of M. Sc. in Civil Engineering (Highways and Traffic).

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 2017 to 2019.

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.

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Abstract

The commonly used hot asphalt mixtures in Egypt cannot fulfill some performance and environmental requirements.

On the other hand, with the huge increase in the cars production, a numerous amount of waste tires need to be dealt with. Due to environmental aspects, several countries forbid the disposal of waste tires in landfills or just throwing it away like in Egypt. Since 1960 Using crumb rubber modifier (CRM) in hot asphalt mixtures has become a frequent practice in road construction all over the world.

There are two methods of using CRM rubber as an additive to hot asphalt mixtures the wet process and the dry process; the commonly used method is the wet process cause it showed a better fatigue and rutting resistance results comparing to the dry process; on the other hand the wet process requires potential modification to the asphalt mix planet and it is more fuel consuming compared to the dry process.

According to these advantages, this research studies the potential use of crumb rubber as an additive to Egyptian's conventional mixes The research evaluates the mechanical properties of dense graded asphalt rubberized mixtures manufactured using the dry process method.

The results obtained from these mixtures were compared with the used conventional asphalt mixtures (control mix).

The mechanical properties of all mixtures were evaluated using Marshall Stability and flow, moisture susceptibility, indirect tensile strength, dynamic modulus and flow number.

The results obtained from this research proved that using the crumb rubber as a modifier to hot asphalt mixtures improves its mechanical properties.

It was found that the optimum crumb rubber content was 0.75% of the aggregate weight.

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Key words: crumb rubber, dry process, asphalt mixtures, Marshall, indirect tensile strength.

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