بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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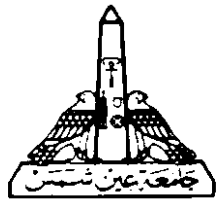

Utilization of Fiber Modified Stone Matrix Asphalt (SMA) Mixes in Egypt

A Thesis
Submitted to the Public Works Department
Faculty of Engineering
Ain Shams University
for the Fulfillment of the Requirements of M. Sc. Degree
In Civil Engineering (Highways and Traffic)

Prepared by

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B.Sc. in Civil Engineering, July 2014
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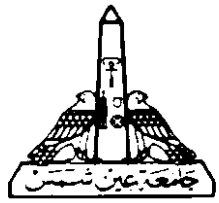
Cairo, 2021



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Date: …../…../ ……

DEDICATION

This work took a part of my life. I wish to dedicate it to who suffered to educate, prepare and help me to be as I am,

TO MY MOTHER AND MY FATHER's SOUL

Also, I wish to dedicate my thesis

to my brother and my sister

for their encouragement and help to complete this work.

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Statement

This dissertation is submitted to Ain Shams University, Faculty of Engineering, 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 2018 to 2021.

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: …. / …. /……

Signature: ……..

Name: Ahmed Essam

Abstract

Stone matrix asphalt (SMA) is a gap graded hot mix asphalt (HMA) which gains its main strength from stone on stone contact. It provides a rut-resistant, durable surfacing material which is suitable for heavily trafficked roads. Typical SMA consists of 70-80 % coarse aggregate, 8-12 % mineral fillers, and 6-7 % binder.

Due to this high binder content, stabilizing additives are needed to prevent draindown that might occur during transport and placement. According to SMA standards, cellulose and mineral fibers are the most suitable stabilizing additives to be used in SMA, but due to lack of those specific types of fibers in some countries, another types of fibers are being tested to replace them in the mix.

The main scope of this thesis is to study the behavior of SMA mixtures using fiberglass as it is one of the common fibers used in Egypt as well as determine the optimum fiberglass content to be used in SMA according to its gradation.

Two different SMA gradations were tested in this thesis, nominal maximum aggregate size (NMAS) 12.50 mm and NMAS 19.00 mm at four different fiber contents for each gradation 0.00 %, 0.30 %, 0.50 %, and 0.70 % of total weight of the mix. SMA samples were tested through series of performance tests selected to be Marshall stability test, moisture susceptibility test, indirect tensile strength test (ITS), and draindown test.

Results showed that for NMAS 12.50 mm, increasing fiber content from 0.00 % to 0.70 % enhanced almost all characteristics of the mix, as the results of the mix with 0.70 % fiber content showed a significant improvement at almost all tests comparing to other samples.

On the other hand, for NMAS 19.00 mm, mixtures with fiber content 0.50 % showed a great improvement over all other samples at the same gradation, and overall NMAS 19.00 mm showed to produce asphalt mixtures with better mechanical properties than NMAS 12.50 mm at all tests.

Key words: stone matrix asphalt, hot mix asphalt, nominal maximum aggregate size, fiberglass, Marshall, indirect tensile strength.