



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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التوثيق الإلكتروني والميكرو فيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكرو فيلم



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Cairo University

USING MODIFIED EMULSION TO IMPROVE COLD IN PLACE RECYCLING PROPERTIES (CIR)

By

Eng.Eslam MohamedEl_Bahady Abdallah

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Civil Engineering – Public Works

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2021

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**USING MODIFIED EMULSION TO IMPROVE COLD IN PLACE
RECYCLING PROPERTIES (CIR)**

Key Words:

Cold in place recycling (CIR);styrene-butadiene rubber (SBR); modified emulsion; cold recycling; design cold mix

Summary:

Cold in place recycling recycle old existing pavement layers by addition water, additives and emulsions without heat to create new binder layer. It is used in local streets, airports, parking and highway roads. CIR layer should has high stability and resistance to the moisture damage. In the research, cationic slow setting emulsion (CSS-1h) is used with copolymer styrene-butadiene rubber (SBR) to improve the stability by 39%, and the resistance of the moisture damage by 40% for CIR mix compared to emulsion only without using copolymer. Modified emulsion increases indirect tensile strength (ITS) between particles with each other by 32% for CIR mixtures, also improves cracking resistance, and rutting resistance by 71%. In Egypt, the usage of CIR layer decreases the cost, the time, increases life time of the pavement with overlay, and saves the energy in addition to environmental benefits compared to alternative maintenance methods. CIR process saves the cost by 25-40% using asphalt emulsion and 33-48% using foam bitumen.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name:

Date: .././...(it's the date that you handover the thesis)

Signature:

Dedication

I dedicate my thesis to my parents and sisters which supported me to complete this study. I thank my responsibility and my friends in the work to save all required possibilities to make tests and save their experiences to do this with best methods. Finally, I thank the professors and doctors' faculty of engineering, Cairo University ahead of them professors and doctors' highway, airport, and traffic department.

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