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شبكة المعلومات الجامعية

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جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائق الاصلية تالفة

بالرسالة صفحات لم ترد بالاصل

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
PUBLIC WORKS DEPARTMENT

EFFECT OF SEGREGATION ON HOT MIX ASPHALT PROPERTIES AND PERFORMANCE

By

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Except where specific reference has been made to the work of others, no part of the work has been, or is currently being, submitted for any degree, diploma or other qualification.

SUMMARY

This thesis is concerned with the effects of segregation on the properties of hot mix asphalt (HMA) and the relationships between segregation and pavement distresses. The objectives and scope of work for this study are to; propose a classification for segregation in HMA, evaluate the effects of segregation in HMA on the properties of the mix (density, air voids, voids in mineral aggregate, and asphalt cement content), and to study the relationship between the segregation in HMA and some pavement distresses (raveling, rutting, and fatigue).

Five pavement test sections were selected for research investigation. Three of them were newly constructed pavements or under construction, the other two pavement sections were old deteriorated constructed between "1980 and 1985" both exhibited two types of distresses; raveling and fatigue cracking. The new pavements were evaluated to study the effects of segregation on the properties of HMA (density, air voids, voids in mineral aggregate, and asphalt cement content). The old pavements were evaluated to study the relationship between segregation and pavement distresses. A thorough literature review was conducted. Previous research covering causes and remedy of segregation, effects of segregation on HMA properties (density, air voids, voids in mineral aggregate, and asphalt cement content), and the relationships between segregation and some pavement distresses (raveling, rutting, and fatigue) were reviewed.

The overall plan of study, laboratory investigation plan, and summary of test results are presented in Chapter 3. Forty-two cores were extracted from site (1) in Mussafah west nearby Abu Dhabi city, ten cores from site (2) 5-km from site (1) on Al Ain – Abu Dhabi truck road, ten cores from site (3) in Bani-Yas city 25-km from Abu Dhabi city, nine cores from site (4) nearby Um Al-Nar refinery, 10-km from Abu Dhabi city, and eleven cores from site (5) in Mussafah east. Tests were performed to determine the mixture properties in the laboratory. The nuclear thin-lift gauge was used to locate the segregated areas and samples were obtained from segregated and adjacent non-segregated areas.

Rutting and fatigue data were obtained from previously published studies. The data were analyzed statistically and statistical models were developed for; the effects of segregation on HMA properties, relationships between segregation and each of raveling, fatigue life and rutting.

The segregation was quantified by both percent of change in surface area and change in percent passing sieve No. 4. The change in surface area was found more realistic to measure the segregation since it represents the total change in the mix gradation while considering the change in percent passing a single sieve doesn't express the entire change in the surface area on the other sieves when segregation occurs. Change in surface area was therefore used in developing the statistical models for the effects of segregation on the properties of HMA, the

relationships between segregation and each of raveling, fatigue life, and rutting in the pavement.

The raveling was quantified by measuring the difference in macrotexture while fatigue was quantified by the number of load cycles until both 30% of initial load and failure. Rutting was quantified by measuring the rut depth in the field. Results indicate that segregation can be categorized into five levels based on the percent of change in surface area. Coarse and Very coarse segregations can be defined by more than 4.7% and 13% decrease in surface area respectively. Fine and very fine segregation levels can be defined by more than 7% and 17.5% increase in the surface area respectively. When the change in surface area in an asphalt mixture is limited between 4.7% decrease and 7% increase, it can be considered non-segregated mixture.

Voids in total mix (VTM) was decreased in fine segregation and increased in coarse segregation. Coarse segregation resulted in raveling. Fatigue life for very fine mixes was found thirty one to thirty two times longer than the fatigue life for very coarse mixes and rutting occurred in both cases; fine and coarse segregation. The very coarsely segregated mixes are the least in resisting rutting.

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