AGGREGATE AND BINDER APPLICATION RATE WITH DIFFERENT NUMBER OF PASSES FOR SURFACE DRESSING PERFORMANCE

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A project report submitted in partial fulfillment of the
requirements for the award of the degree of Master of Engineering
(Civil – Transportation and Highway)

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NOVEMBER 2009

ABSTRACT

Surface dressing is a very useful and cost effective process for restoring skid resistance to a road surface that is structurally sound. In the new roads adequate surface texture is designed in the running surface by specifying requirements for both aggregate properties and texture depth. The objective of this study is look on the effect of aggregate application rate, binder application rate and number of passes on surface dressing performance. This study involves 6, 10, and 14mm size of aggregates. All the aggregates were laid with penetration grade 80-100 bitumen. Skid resistance and texture depth were measured by British Pendulum Test (BPT) and Sand Patch Test (SPT). Results were analyzed using analysis of variance (ANOVA) using (Minitab15) to justify the objectives. The result showed that 14mm generated higher skid resistance and texture depth.

ABSTRAK

Penggunaan material seperti kain untuk menutup permukaan sangat berguna dan ini merupakan salah satu kos yang sangat berkesan untuk memulihkan runtuhan/regangan yang berlaku terhadap permukaan jalan yang disebabkan oleh gegaran ke atas struktur binaan . Dalam pembinaan jalan baru, tekstur permukaan yang cukup baik direka dalam pembinaan permukaan iaitu dengan menetapkan keperluan untuk kedua-dua agregat pembangunan dan tekstur dalaman. Objektif daripada kajian ini adalah untuk melihat kesan bagi aplikasi nilai agregat, tahap aplikasi pengikat dan jumlah keberkesanan atas penggunaan lapisan permukaan. Kajian ini melibatkan 6, 10, dan saiz 14mm agregat. Semua agregat telah dibebankan dengan tingkat tekanan 80-100 bitumen. Regangan yang berlawanan dan tekstur kedalaman diukur oleh British Pendulum Test (BPT) dan Sand Patch Test (SPT). Keputusan dianalisis dengan menggunakan analisis varians (ANOVA) dengan menggunakan (Minitab15) untuk mengesahkan tujuan dan objektif kajian. Keputusan kajian menunjukkan bahawa regangan 14mm yang dihasilkan lebih tinggi dari kalis regangan dan tekstur kedalaman.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Bitumen has been use for various purposes including road making, however, Gorman et al., (2004) (8) traced the use of bitumen in a range of applications, including mummifying the dead and as a waterproofing agent, to over 5000 years. Now, the main use of bitumen is in the road making industry for construction and maintenance. In road making, bitumen products are typically applied with mineral aggregate. The strong adhesion that occurs between the bitumen and mineral aggregate enables the bitumen to act as a binder, with the mineral aggregate providing mechanical strength for the road. Bitumen is difficult to work with at ambient temperatures since it is a highly viscous material under these conditions. It can, however, be transformed into a workable state by either applying heat (hot mixes), by blending with petroleum solvents (cutback mixes) or by emulsification with a surfactant in water to form a bitumen emulsion.

Surface dressing is still one of the most economical and versatile surfacing options, and properly applied using advanced binders, a highly cost-effective

solution. It is potentially suitable for all classes of road. Though it cannot strengthen the highway or correct its profile, surface dressing does seal the surface against ingress of water, while its chippings provide a skid-resistant surface. Using natural-coloured aggregates, such as gravels, provides an attractive finish.

Surface dressing is an established, proven process. It is the most cost-effective surface maintenance treatment when properly designed, specified and executed. Developments in surface dressing materials, techniques and equipment mean that problems of which it is often accused can be minimized or eliminated. Unless the amount of surface dressing is increased our roads will continue to deteriorate. This will result from the lack of sealing of the surface and less roads being treated because of higher alternative costs and financial constraints on budgets (United Kingdom Road dressing Association, 2005).

United Kingdom Road dressing Association, (2005) stated the following reasons for which Surface Dressing is done

i. To seal the road surface against ingress of water.
ii. To arrest the deterioration of the road surface.
iii. To provide a skid resistant road surface with the resultant benefits of reduction in accidents.
iv. To reduce spray.
v. To maximize the cost effectiveness of limited highway maintenance funds.

Surface dressing if required before the road surface deteriorates to the stage at which expensive major patching and/or reconstruction is required. It is also required before surface skidding levels fall below the nationally accepted level for the class of road in question. All classes of road, from single track, unclassified roads and footpaths to national high speed motorways can and have been successfully treated Regarding the Environmental consideration**,** Surface dressing minimizes the use of

scarce national aggregate resources - all the stone used is in direct contact with the tyre of the motorist, not buried below the road surface, Accident levels will be reduced, and proper attention to detail can minimize the surface use noise (United Kingdom Road dressing Association, 2005).

Normally, surface dressing requires a high quality of workmanship and materials. Binder is heated in and applied by a distributor. Good quality chippings, in terms of grading, shape, cleanliness and hardness, are applied by a purpose made spreading device. However, surface dressing can be done by labour based methods but it is usually not of high quality. It can be relatively expensive unless suitable gravel, which can be easily screened, is available locally. For the trials, locally available hand-crushed rock could be easily screened to give two nominal sizes of aggregate. Dust in the smaller sized chippings was removed by manual segregation. Washing with river water could have been carried out had this been necessary (Akpokodje and Hudec 1992) (4).

1.2 **Problem Statement**

Surface dressing is one of the oldest and most widely used forms of treatment used in highway surfacing. In its simplest form it involves spraying a coat of bitumen to seal the existing road surface from the ingress of water followed by the application of aggregate to provide a texture surface for wet skid resistance. This simple process has steadily evolved over the years with the use of conventional binders and differing applications of aggregate sizes. A growing number of performance expectations now influence the choice of surfacing materials. However, because the decorative aggregate is just the depth of a single layer of stones, any loose aggregate might be flicked out by wear or trafficking. Aggregate should not be so small that they are rapidly embedded into the underlying surface or too large that may they be dislodged by traffic. They should have strength characteristics and resistance to polishing

appropriate to the road being surface dressed. The problem statement is thus what effect does size of aggregate and binder application rate of the performance of surface dressing.

1.3 **Objectives of Study**

The objectives of this study are as follows:-

i. To look on the effect of aggregate application rate, binder application rate and number of passes on skid resistance and Texture Depth,
ii. To select and recommend the best application rate of aggregate and binder.

1.4 **Scope of Study**

This research will focus on three sizes of aggregate, 14mm 10mm and 6mm aggregate. Study on types of such aggregate is outside the scope of this research. Among the types of binders available, the research will use conventional 80/100 penetration grade bitumen binder and the surface dressing to be applied will be in accordance with JKR/SPJ/2008(15). The entire test is conducted at Makmal Pengangkutan, UTM Skudai.

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