MICRO SURFACING

Proposed by

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EXECUTIVE SUMMARY

Roads are the important assets to enhance the economy of our country. As we all know, roads in Malaysia always have their problem such as cracks, surface deformations, surface defects, patches, potholes and edge defects. All this deformation can make the users feel uncomfortable while using the roads. The current high maintenance cost is due to badly deteriorated roads which require rehabilitation works. Prevention is the solution to this problem resulted in saving to the Government. We should have to maintain and upgrade the roads with the new maintenance treatments and Micro surfacing is the best solution to maintain and upgrade the roads.

Micro surfacing is a high performance, safety and cost effective maintenance technique which can give plentiful benefits to the government and road users as following key benefits:-

1. **Cost saving** up to 30% and improve overall network with additional 30% from same amount of budget compared to conventional maintenance technique – Mill & Pave
2. **Safer road** due to improvement of skid resistance on existing surface which results in reduce spraying on wet surface, less hydroplaning problems and enhance driving vision at night
3. **Less traffic interruption, fast work execution and suitable for night application** due to quick set-Quick traffic, Micro surfacing can re-open to traffic within 1 hour after application
4. **Prolong lifespan** of underlying road before investment is lost
5. **Better appearance** as Micro surfacing will give a new unique skin to road surface and aid in lane delineation with an attractive, smooth black surface
6. **Thin surfacing technique** can seal small cracks, fill rut and provide some surface leveling without alteration of drainage or re-level and no dead weight added to existing structure
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Exhibit A : Micro Surfacing Photo
1.0 Introduction

Road plays an important role in the communication system of mankind. From the early form of road structures to modern design approaches, road provide a mean of safe and economical for transportation for goods and people.

For the road to perform functionally and structurally, a durable water proof, skid resistance and dust – free surfaces are required. This is necessary in order to provide the road user with acceptable level of service and to protect structural layers of the road from abrasive forces of traction from traffic and from the effect of environment.

BINA MASYHUR proudly introduces new road maintenance technique, Micro surfacing, which will have a lot of advantages over conventional maintenance practices/techniques and will be technically and economically elaborated in this proposal.

2.0 Objectives

The purpose of this proposal is to provide the alternative federal road maintenance technique, Micro surfacing called Colmat® or Rugoseal®.

Micro surfacing is a mixture of a quick setting Polymer modified bitumen emulsion, dense-graded aggregate, water, mineral filler (Portland cement) and additives which is laid by slurry machine. Micro surfacing is a preventive maintenance technique that improves skid-resistance on existing surface with unique surface texture and less interruption to traffic due to quick set-quick traffic behavior. Besides, Micro surfacing can address various surface problems such as correct minor pavement surface flaws, fill ruts. It can be used on urban roads as well as heavy traffic volume roadways for both bituminous and concrete pavement.

3.0 Current Maintenance Practice

After resurfacing work completed, some roads have no treatment conducted until failures occur. Through times, failures had buildup causing the road to deteriorate badly resulting in major road failures which are time consuming and expensive to repair.
When the major roads occur, major treatment must do such as mill & pave, reconstruction and base stabilize depends on how critical of that failure. All this treatment needs the expensive cost.

Micro Surfacing can give more skid resistance surface compare to normal premix to reduce accident. Because of that, BINA MASYHUR would like to address the current limitations, problems and JKR’s treatment selection criteria.
4.0  **Micro surfacing Application**

Quality of Micro surfacing application shall be conducted and controlled in accordance to *Recommended Performance Guidelines For Micro surfacing A143 (Revised) May 2005* from International Slurry Seal Association (ISSA) and *JKR/SPJ/2008 section 4.13 Surface Treatment 2 – Micro Surfacing* from Jabatan Kerja Raya as attached in Exhibit A.

5.0  **Advantages of Micro surfacing**

Micro surfacing technique provides numerous advantages to existing surface as following:

5.1  **Technical**

A) **Safer Road with superior surface texture:**
   • Increase skid-resistance
   • Reduce spraying on wet surface
   • Eliminate hydroplaning problems
   • Enhance driving vision at night
   • Reduce accident

B) **Quick set-Quick traffic: Open to traffic within 1 hr**
   • Allow to perform more work (surface area) per day
   • Return road to users quickly
   • Less traffic interruption or lane closure during construction
   • Suitable for night application
   • Can be applied in a broad range of temperatures and weather conditions
   • No damage if light raining after 1 hr application completed

C) **Good cohesion: benefits from polymer (natural latex)**
   • Better chip (aggregate) retention or less loosing chip problem
   • Rut Filler (Re-profiling) as a scratch course (leveling) up to 1 ½ inches (38 mm.) – no plastic deformation
   • Multi-layer application is allowed

D) **Use of bitumen emulsion (water based bitumen):**
   • Low energy requirements – applied at ambient temperature
   • Environmentally safe
   • Emit no pollutants

E) **Unique thin, restorative surfacing technique:**
   • Not alter drainage or re-level – solve problem without milling
   • Insignificant additional dead weight to existing structure, especially bridge structure
F) Other advantages: on existing surface
• Provide color contrast for lane separation
• Restore surface characteristic
• Enhance waterproofing
• Extend service life
• Seal minor cracks

5.2 Economic

A) Cost efficiency for maintenance:

Typical service life* and cost per area (m$^2$) between a conventional maintenance technique – Mill & Pave, Overlay and Micro surfacing are illustrated in table 1:-

<table>
<thead>
<tr>
<th></th>
<th>Mill &amp; Pave</th>
<th>Overlay</th>
<th>Micro surfacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service life* (yrs)</td>
<td>4-6</td>
<td>3-5</td>
<td>3-5</td>
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<tr>
<td>Cost** (RM/m$^2$)</td>
<td>30</td>
<td>24</td>
<td>18</td>
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</table>

* Service life mentioned is based on the average number of years from application of technique to the year where road condition reaches the minimum acceptable level (40% drop in quality of road condition) where road needs maintenance.

"Micro surfacing’s life expectancy usually exceeds seven years" – ISSA’s Micro surfacing: Pavement Resurfacing

**See estimated cost of applications

Consider cost per area (m$^2$) for maintenance a road during 20 years, using the information above, the road requires to perform Mill & Pave four times during year 5$^{th}$, year 10$^{th}$, year 15$^{th}$ and year 20$^{th}$ with total cost per area of RM 120/m$^2$. Meanwhile, Micro surfacing shall be laid on year 4$^{th}$, year 8$^{th}$, year 12$^{th}$, year 16$^{th}$ and year 20$^{th}$ with total cost per area of RM 90/m$^2$ as shown in table 2 and Figure 1. Overlay shall be laid same with Micro surfacing with total cost per area of RM 120/m$^2$. The cost overlay is same with Mill & Pave.

Hence, Micro surfacing could save up to 30% on maintenance cost over 20 year period compared to Mill & Pave and Overlay technique.
Table 2: Cost per area (RM/m\(^2\)) during 20 years

<table>
<thead>
<tr>
<th>Year</th>
<th>Mill &amp; Pave</th>
<th>Overlay</th>
<th>Micro surfacing</th>
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<tr>
<td>TOTAL</td>
<td>120</td>
<td>120</td>
<td>90</td>
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</table>

Figure 1: Road condition using Mill & Pave and Micro surfacing
B) Improve OVERALL road networks:

With same amount of maintenance budget, Micro surfacing can improve more roads than Mill & Pave and Overlay due to lower cost of application per area. Considering RM 100 million maintenance budget for 20 year period, total of 833,333 m$^2$ of road network area can be improved using Mill & Pave and Overlay technique while Micro surfacing can be restored up to 1,111,111 m$^2$ or additional 30% of road network can benefit from the same amount of budget. In another word, Micro surfacing therefore can effectively and efficiently improve overall road networks.

<table>
<thead>
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<th>Table 3: Road network to be improved over 20 year period</th>
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<tr>
<td><strong>Budget (RM)</strong></td>
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<td>100,000,000</td>
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<tr>
<td>Cost (RM/m$^2$) over 20 yr</td>
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<td>Road network area that can be improved (m$^2$)</td>
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</table>

C) Time saving for maintenance works:

With average working rate without any interruption from site condition, weather or traffic, Micro surfacing technique can normally be applied up to 8,000 m$^2$ per day. Whereas, Mill & Pave could be done 3,000 m$^2$ per day on average. Obviously, Micro surfacing can complete the same amount of work faster than Mill & Pave. Table 4 is giving an example for time consuming aspect.

<table>
<thead>
<tr>
<th>Table 4: Time consume to complete maintenance work for 500,000 m$^2$</th>
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<tbody>
<tr>
<td><strong>Maintenance area (m$^2$)</strong></td>
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<tr>
<td>1,000,000</td>
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<tr>
<td><strong>Amount of work per day (m$^2$)</strong></td>
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<tr>
<td><strong>Duration to complete work (days)</strong></td>
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</table>

6.0 Criteria for implementation of Micro surfacing

A) Address on Road Safety Matter:
- For roads that have polished surface or low skid-resistance i.e. British Pendulum Number (BPN) < 46 or texture depth by sand patch < 0.5 mm
• For roads that have high number of accidents
• For areas that safety is needed i.e. turning curves, slope (up-hill & down-hill), crossing way, junction, emergency stop lanes, parking areas, shoulders, toll-booth areas, cycle paths or lane selection roads

B) Extend pavement life:
• For roads being in service up to 4 years which has no structural problem or all structural problems have been solved
• For roads with residual life (remaining pavement life) more than 7 years using FWD.

7.0 Estimated cost of applications

Break down cost for Mill and Pave: -
- Milling 50mm - RM 5.90/m²
- Tack coat - RM 1.14/m²
- ACW 20 (50mm): RM 432.16/m² - RM 21.60/m²
- TOTAL RM 28.64/m² ~ RM 30.00 /m²

Micro surfacing cost:
1 layer of Micro surfacing* RM 18.00/m²
* included 10% of total area for re-profiling
Exhibit B

(Micro surfacing Photo)
A loader delivers aggregate to the 12-cubic-yard (3.2-cbm) aggregate bin, which is then metered to the pugmill. A flow meter at the operator’s control center directs additives from the liquid additive tank to the pugmill. Dry additives are delivered to the pugmill for mixing via a delivery system within the fines feeder. A Blackmer positive displacement valve pump moves emulsion from the tank at the front of the system to the pugmill beneath, and toward the back of the aggregate bin. The twin-shaft paddle wheel distributes mixed material to a spreader at the end of the machine.