Central District Reseals - Variable Spraying

Mahendra Mistry

Boral Asphalt achieved good results recently when they completed Central District's 2002/2003 reseal program using variable spray rates.

The district adopted the variable spray rates to overcome problems associated with lateral variations in existing surface textures. Typical problems involved flush wheel paths with hungry sections in between.

Although the spray rates were specified in the tender documentation, the methodology for achieving them was not.

The method employed by Boral involved the use of two sprayers. The first machine sprayed the areas requiring the heavier spray rate, and then the second sprayed the full width, effectively applying two coats to the areas requiring the heavier rate.

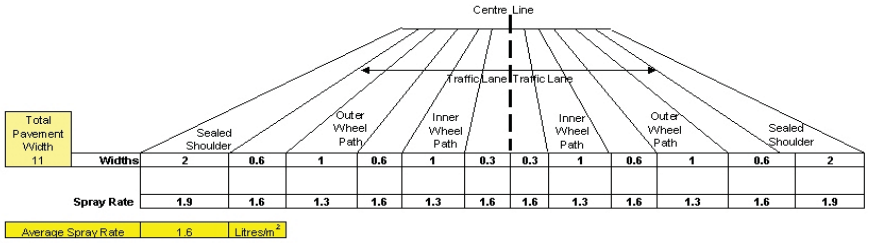
For example: to achieve a rate of 1.2 l/m^2 in the wheel paths and 1.5 l/m^2 between the wheel paths, the first sprayer would spray between the wheel paths at 0.3 l/m^2 then the second sprayer would spray the full width at 1.2 l/m^2. Normal aggregate spreading and rolling operations followed this process.

The design spray rates and widths were detailed on 'Transverse Variable Spray Sheets' with the rates and widths also marked on the road.

To their credit, Boral adapted to the process with very few problems. The use of two sprayers also proved to be beneficial in other aspects of the reseal operation including: additional site storage, shorter delays and additional capability for turnouts.

Overall, the use of the variable spray rates for the reseals was successful and will become a regular feature of the district's future reseal programs.

The diagram below shows the variable spray rates being adopted.



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Strategic Alliance
NEWS LETTER
Developing superior flexible pavements
Issue 2 of 2003

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Inside this issue:

Articles in this and prior newsletter available on the web site at http://www.aapa.asn.au/docs/queensland.html *and on Main Roads Intranet at* http://pmg

Strategic Alliance Innovations in the Regions

In the last newsletter, we highlighted the need for more district involvement in Strategic Alliance activities.

Hence, this issue presents recent innovations and trials in pavement surfacings being undertaken in Townsville, Toowoomba and Rockhampton Districts. Each of these activities have involved both Main Roads and AAPA members cooperating to bring a range of new ideas into practice.

SMA (SM14) Trial in Townsville

Marissa Nicolls and David Derrick

The aim of this trial is to maximise the probability of the successful use of SMA in the Northern District. The district has taken this opportunity to assist the local asphalt producers to test their mix design, production and placement processes, whilst allowing time for refinement to occur prior to the use of SMA. It also allows the district to benchmark the local SMA against other mixes produced in the state.

A northern specification has been issued for use in this trial. The specification is the modified SM14 specification altered slightly to include a clay index test on the combined filler content. The trial section is located on the Bruce Highway just south of Townsville. Boral and Pioneer were both offered contracts to place a section under sole invitee conditions.
The Boral section was placed on 14 and 15 May 2003. Following rain, approximately two weeks after placement, the SMA surface looked like it had been lime washed. It is considered that the lime washed look is a result of the free lime mixing with water (lime leaching). After a relatively short period of time, the pavement has returned to a "normal" surface appearance. Pioneer have an approved mix design and are currently making some plant modifications to be ready to place their trial in July 2003. Testing of the trial mixes has included:

- materials (including clay index)
- production checks
- permeability
- skid resistance
- density
- texture.

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Recent Flexible Pavement Initiatives in Townsville

David Derrick

The Boundary Street Project - Using Flexible Pavements to Solve the Problem of Traffic Induced Noise and Vibration

Townsville's Boundary Street project presented Main Roads with the challenge of mitigating traffic induced noise and vibration to levels which satisfy human comfort. Construction of a smooth, multiple layer, "low noise" flexible pavement was rationalised as the most cost effective and practical solution. Some interesting and innovative strategies were successfully implemented during the design and construction of this project.

Townsville Trial of Low Noise Asphalt Surfacings

Main Roads commissioned a Townsville trial of proprietary low noise asphalt surfacings in July 2002, namely Boral's *LoNoise* and Pioneer's *Hushphalt.* This controlled trial was used to select the surfacing layer for the Boundary Street project and to facilitate ongoing research into the development of "low noise" asphalts. An ongoing program has been implemented to further assess noise sustainability and other performance attributes of the trial surfaces. Boral's *LoNoise* was primarily adopted for the Boundary St project for its merits on two fronts:

- Noise performance on the trial site – *LoNoise* provided the most useful noise reductions of the trialled products. *LoNoise* was 5.9dB quieter than the existing dense graded asphalt for the passage of cars, 4.2dB quieter for medium trucks and 3.4dB quieter for heavy trucks.
- Permeability characteristics – the Boundary Street design necessitated that permeability of the new surfacing layer be comparable to the adjoining dense graded mixes (the surfacing layer had to be keyed-in or matched to the existing dense graded material to preserve surface drainage). The open graded *Hushphalt* was highly permeable, whereas the gap graded *LoNoise* displayed low permeability.

The Strategic Alliance Reference Group meets on Tuesday 19 August 2003 at the Bardon Conference centre - details on the website

Key Strategies used in Achieving a Low Noise / Low Vibration Pavement on Boundary Street

A DMR / Boral partnering arrangement was established for design and construction. Boral were offered this contract as a sole invitee, with all tender prices negotiated. Knowledge and risks were shared through this process. Job specific strategies were implemented to optimise smooth pavement construction in an urban environment - particularly for traffic management, process control and surface defect elimination.

A unique "whole of job" high bonus / high penalty arrangement for surface evenness was implemented to be commensurate with the end-product value to the community (to meet vibration expectations) and the construction risks for the contractor. Computer simulated road roughness modelling and road roughness templates were tools used for optimising surface evenness on the multiple layer flexible pavement.

Community Satisfaction - Noise and Vibration Improvements on Boundary Street

Post construction noise measurements are all below the Main Roads 68 decibel criteria for Boundary Street. The overall average noise has reduced by approximately four decibels, which can be mainly attributed to the performance of the *LoNoise* asphalt surfacing.

Ground vibration was measured in premises adjacent to the road and its overall average level has reduced by 70% from that prior to the reconstruction. This can be mainly attributed to the improvement in road roughness from 63.5 counts/km to 22.6 counts/km. This is an excellent standard, especially considering the reconstruction had to be retrofitted to the existing adjoining geometry. A bonus payment resulted.

DMR conducted a postal survey of Boundary Street residents in March 2003, four months after construction. 86% of respondents reported an improvement to traffic noise and 90% of respondents reported an improvement to traffic vibration.

The final cost of the Boundary Street upgrade was $2.2 million, well under the original budget of $5 million. Sustainability of performance will be the ultimate judge of this project's success.

Transverse Variable Bitumen Spraying – Southern District (Toowoomba)

David Seefeld

Where is Southern District?

It starts at the end of the asphalt heading west on the Warrego Highway from Brisbane.

Traditional low levels of funding for resurfacing on the district networks have driven us to search for better solutions to age-old problems. You would think that by now all of the answers would be known, but this is not so.

Who has never seen a seal that has either stripped to some degree or flushed up in the wheelpaths? Did the engineer make a mistake in the seal design?

Probably not. He would have followed the Austroads Seal Design method taking into account AADT, ALD, FI, commercial vehicles and existing surface condition.

Why then do we still have failures?

The basis for any seal design is the voids factor, which is derived from the volume and type of traffic. We know that different volumes and spectrums of traffic will impact on the aggregate in the wheelpaths and realign the aggregate onto its ALD. As the stones rotate, they decrease in height and the bitumen is displaced and forced up. If there is too much bitumen, it will rise to the top of the stones resulting in a flushed seal. If there is not enough bitumen, the stone will be dislodged as it is rotated.

The problem with any seal design arises because of the compromises and concessions that have to be made when designing the seal.

Traffic tends to drive in set locations across the road – influenced by the width and linemarking. If we look closely at where the traffic drives, you will notice that certain elements of the road actually get very little traffic – typically, these areas are the shoulders, between the wheelpaths and along the centreline.

If we were to do a seal design in it's purest form, we would realise that we actually need more than one spray rate to address the varying amounts of trafficking across the pavement. This applies equally on roads carrying 70 or 7000 vehicles per day – although the contrasts are generally more pronounced with the higher traffic volumes.

The need for different spray rates across the pavement became a real issue in the early 90's.

A transverse variable spray bar was created using a standard spray bar and modified nozzles. This set-up was an operator's nightmare and the process had many limitations. However, the superior performance of these seals using class 170 binder was clearly evident and this gave us the encouragement to carry on. In 1993, we were able to replace our sprayer with a purpose built twin bar sprayer. This gave us the capacity for total control over our seal design. We are able to design the correct spray rate for the wheelpaths and also for the non-trafficked areas. Difference in spray rates may be as little as 0.1 l/m^2 or as high as 0.6 l/m^2 – without changing nozzles and with full control over each spray rate – and done in a single pass!

This superior technology has enabled us to take sealing practice to another level. Existing stripping or flushing problems can be corrected in a single pass operation. New work in high traffic areas can be targeted to allow for embedment in the wheelpaths. Combined with PMB binders and a specially developed aggregate (nom.12 mm), we have been able to continue with chip sealing when others have said sealing is not an option.

The success stories are too many to mention. Transverse variable spraying is now a major part of our reseal program.

As for the future – we look forward to the time when sealing practice is understood by all involved in decision making and by those tasked with training others…when transverse variable spraying is the industry norm for a whole range of sprayed sealing situations.

And yes….we would use asphalt on more of our network if we had appropriate funding levels.