pavement work tips

Sprayed Sealing - Uniformity and Neatness

pavement work tips — no. 21 February 2000

INTRODUCTION

Uniformity of binder application rates and neatness of joints in sprayed seals are influenced by work practices that include proper use of spray nozzles for uniform binder distribution, start and finish procedures, and construction of joints between adjoining runs. Consideration may also be required for differential binder application rates on curves.

Further work tips in this series refer to joint location and setting out works to minimise variation from handwork and spraying of transitions and odd shaped areas.

SPRAY NOZZLES

Nozzles generally used for bitumen spraying in Australia are slotted nozzles of the "Copley" type. Copley spray nozzles are manufactured in three sizes designated A, B and S. For most applications, A size nozzles comprising A4 intermediate nozzles and EA4 end nozzles are used. Larger, B size intermediate nozzles are sometimes used for spraying more viscous materials such as some modified binders. Smaller, S size nozzles may be used where lighter binder application rates are required.

Spraying Systems 8070 nozzles, commonly used in New Zealand, have similar spraying characteristics to Copley A4 nozzles but with a lesser fan width.

Spray nozzles should be inspected regularly for damage that might affect spraying efficiency.

Nozzles must be properly aligned in the spray bar to provide correct overlap. Spray bars are designed to apply a uniform application of binder across the width of the bar using intermediate nozzles of all the same type and a single end nozzle at each end. An alternative to the use of EA4 end nozzles is an intermediate jet turned by 30° to a spray at an angle of 60°. In such cases a jig must be used to set desired alignment of the end nozzle.

End nozzles (EA4 or jig-set intermediate nozzles) ensure that the full binder application rate is maintained to within 50mm of the full width sprayed. If end nozzles are not used, the binder application rate will taper over a distance of about 300mm resulting in insufficient binder to properly retain aggregate.

Different size nozzles **MUST NOT** be used across the bar, as it will result in non-uniform and unpredictable binder application rates.

Where transverse variations in binder application rates are required because of varying surface texture, suitable procedures are:

- Use of a purpose built sprayer with individually controlled, twin spray bars.
- Pre-spraying binder in the coarse textured areas.
- Application of a "correction" seal using a small sized aggregate.

Key Summary

This issue of 'pavement work tips' provides a guide to aspects of bitumen sprayer operation and work practices that lead to uniformity and neatness of sprayed seal work.

START OF A SPRAYER RUN

Correct commencement of a sprayer run involves:

- Use of paper at the start of the run to ensure a straight, neat joint;
- Providing guide marks for the sprayer;
- Aligning the sprayer about 5 to 10 m before the paper, using the guide road and guide marks.

The 5 to 10 m approach is used to ensure that:

- The sprayer is properly aligned and edges of runs match;
- The sprayer is travelling uniformly at the correct forward speed for the design binder application rate;
- The bitumen pump speed has stabilised.

As soon as spraying starts, a visual check should be made to ensure that all nozzles are spraying correctly. If not, the sprayer should be stopped and the nozzles cleared/replaced as required.

FINISH OF A SPRAYER RUN

It is generally unnecessary to finish on paper except:

- At the end of a day's work
- At the end of a job.

continued on reverse

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POOR START AND FINISH SPRAYING PRACTICES

Omission of starting papers.

The end result is an uneven joint as well as possibly overlapping or leaving a gap to the previous run.

Standing starts

A sprayer generally needs at least 5m to accelerate to the forward speed required. Standing starts do not allow time for the sprayer pump to adjust or for the sprayer to be travelling at a constant forward speed when spraying starts. This often results in an uneven application of binder and increased potential for stripping or bleeding.

CONSTRUCTING JOINTS BETWEEN ADJACENT SPRAYER RUNS

Common practice is to overlap the binder between adjoining runs prior to spreading with aggregate with the intention of achieving a "seamless" joint. This requires the correct selection of spray nozzles and width of overlap.

Incorrect overlapping can results areas where there is:

- insufficient binder to hold the aggregate and a potential for stripping; or,
- too much binder and a potential for flushing.

Table 1 indicates the correct overlap for commonly used nozzle types.

It is important to use the same type of nozzle (i.e. end nozzles or intermediate nozzles) on both overlapping edges. Overlap between binder sprayed with an intermediate nozzle and an end nozzle can result in a binder application rate with a variation of up to double the designed rate in the overlap area.

Spray bars that are adjustable in width on the run require particular consideration. Where reduction in width involves an intermediate nozzle forming the outside edge of a sprayer run, the adjoining overlapping run must also use an intermediate nozzle to obtain the correct binder transition.

SPRAYING AROUND CURVES

Spraying around tight curves can result in a significant difference in binder application rate between the inside and the outside of the curve. Binder application rate will increase with reduced speed on the inside of the curve while the higher speed of the outside edge results in lower rates. Table 3 gives and indication of the variation between inner and outer edges for different spray bar widths and curve radii.

Suggested guidelines for selection of spray bar width to avoid excessive variation in binder application rates are shown in Table 2.

For more information on any of the construction practices discussed in "pavement work tips", please contact either your local AUSTROADS Pavement Reference Group representative or AAPA — tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au

A complete list of "pavement work tips" issues is available on AAPA's web site: www.aapa.asn.au

Issues may be downloaded using Adobe Acrobat Reader. Copies may also be obtained from AAPA.

This edition was prepared by Ian Cossens, Walter Holtrop and John Rebbechi in consultation with members of the National Bituminous Surfacings Research Group (NBSRG)..

Table 1: Binder overlap

Configuration	Overlap required
Overlapping adjacent sprayer runs prior to spreading aggregate: • using AE4 or jig-set intermediate end nozzles • using A4 intermediate nozzles only	 50mm 200 - 300mm
Overlapping paved and previously sealed surfaces	20 - 50mm (AE4 or jig-set intermediate end nozzles)

Table 2. Suggested maximum spray bar width

Curve Radius	Maximum spray bar width
> 100 m	8 m
30 – 100 m	4 m
< 30 m – traffic < 600 v/l/d	4 m
< 30 m – traffic > 600 v/l/d	2 m

Table 3: Indicative binder application rates on curves

Radius of curve (centre of sprayer) m	Spray width m	Variation in application rate %		Examples of binder application rate variation L/m²		
		Outside curve	Inside curve	Design	Outside of curve	Inside of curve
7.5	2	- 13	+ 18	1.5	1.32	1.73
7.5	4	- 26	+ 36	1.5	1.18	2.05
15	2	- 6.7	+ 7.1	1.5	1.41	1.61
15	4	- 13	+ 15	1.5	1.32	1.73
15	8	- 26	+ 36	1.5	1.18	2.05
30	4	- 6.7	+ 7.1	1.5	1.41	1.61
30	8	- 13	+ 15	1.5	1.32	1.73
60	4	- 3.3	+ 3.4	1.5	1.45	1.55
60	8	- 6.7	+ 7.1	1.5	1.41	1.61
120	4	- 1.7	+ 1.7	1.5	1.48	1.53
120	8	- 3.3	+ 3.3	1.5	1.45	1.55