

Sprayed Seals - Selection of Spraying Nozzles

pavement work tips — no. 33

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INTRODUCTION

Application rates for bitumen binders are based on the combination of a uniform rate of discharge from spraying nozzles and varying sprayer forward speed (see Work Tip No 29, Determining Sprayer Forward Speed).

The selection, setting and condition of nozzles (also called jets) is essential to uniformity and accuracy of binder application rates.

As part of the review of sprayer calibration procedures (see Work Tip No. 34 Sprayer Calibration), agreement has been reached on an Austroads identification system. Nozzles carrying the Austroads marking must also conform to agreed manufacturing standards.

SPRAYING NOZZLE CONFIGURATION

Bitumen spraying nozzles used in Australia are of the slotted type with an opening set at an angle of 30° to the body of the nozzle (except for end nozzles) – see Figure 1.

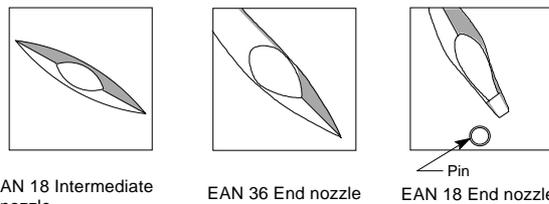


Figure 1 Spraying nozzles

Correct alignment in the spray bar can be checked by ensuring that the stamped face of all nozzles is parallel to the spray bar (this can be verified with a straight edge along the face of the nozzles). The only exception to this is where an intermediate nozzle is turned to act as an end jet, with the angle being set by a calibrated jig.

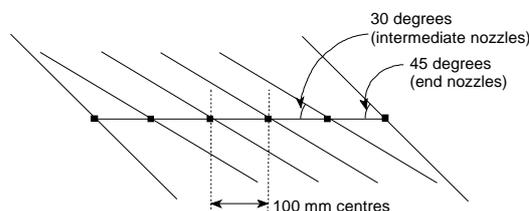


Figure 2 Spraying configuration (AN 18 intermediate and EAN 36 end nozzles)

When operated at the correct pressure and binder consistency, and set at a height of 250 mm, each intermediate nozzle will provide a uniform spraying fan width of about 450 to 500 mm (400 to 450 mm effective width) – see Figure 2.

BINDER VISCOSITY

The rated output of nozzles is based on the spraying viscosity of bitumen at 165 to 180°C (0.05 to 0.1 Pa.s). The temperature of cutback bitumen and other binders should be adjusted to give comparable viscosity. Cutting charts generally provide this information. Higher temperatures (lower viscosity) can lead to atomisation and excessive spray. Lower temperatures can lead to reduced output and poor fan shape leading to streaking and inaccurate binder application rates.

Larger sized nozzles (see Table 1) are particularly used for high bitumen content emulsions and crumb rubber bitumen binders that will not flow freely through the smaller nozzle sizes.

AUSTROADS DESIGNATIONS

Existing nozzle identification numbers are largely carried over from imperial numbers. For example, an A4 nozzle was designed for 4 gallons per minute. New Austroads identification numbers are based on the following:

- “A” to identify as Austroads specified spraying nozzle
- “AN” to denote an intermediate nozzle
- “EAN” to denote special end nozzle
- A number indicating rated output in L/minute.

Key Summary

This issue provides a guide to the selection and use of bitumen spraying nozzles and introduces new Austroads identification standards.

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Existing S1 nozzles are to be withdrawn from the market as they are rarely used. Existing A4 nozzles with rated output of 17 L/min as used in NSW, and other non-conforming nozzles, are to be withdrawn over

a period of two years. **It is important that nozzles are replaced as a complete set and the sprayer recalibrated. Nozzles of different sizes or standards must not be mixed at any time.**

Table 1 Austroads spraying nozzle identification

Intermediate nozzles			End nozzles			Typical uses
Existing designation	Austroads designation	Rated output (L/min)	Existing designation	Austroads designation	Rated output (L/min)	
S2	AN 9	9	ES2	EAN 9	18	Enrichment rejuvenation and other uses requiring very light application rates
A4	AN 18	18	EA4	EAN 36	36	General spraying applications for bitumen, cutback bitumen and PMBs
			EA4 (W) ¹	EAN 18 ¹	18	
B6	AN 27	27	²	²		Spraying high bitumen content emulsions
B8	AN 36	36	²	²		Spraying hot crumb rubber bitumen binders

Notes:

1. The modified end nozzle, developed in WA, provides half the fan width and half the output of an EAN 36 – see also notes on spraying width, below.
2. There are no specific end nozzles manufactured for AN 27 and AN 36 applications. EAN 36 end nozzles may be used with AN 27 and AN 36 intermediate nozzles.

SPRAYING WIDTH

Nozzles are placed in spray bars at 100 mm centres. The effective spraying width depends on the configuration of end nozzles.

EAN 9 and EAN 36 nozzles will contribute to full application rate 100 mm either side of the outer nozzle, with a further 50 mm (approx.) of overspray. Effective spraying width is therefore obtained by multiplying the number of nozzles (including end nozzles) by 0.1m and adding 0.1m (see Figure 3).

EAN 18 nozzles are designed to cut off directly under the outer nozzle. The effective spraying width is therefore obtained by multiplying the number of nozzles by 0.1m and subtracting 0.1m (see Figure 4), or measured directly between the pins placed on the EAN nozzle (Figure 1). Overspray of up to 150 mm is generally controlled using an end shield.

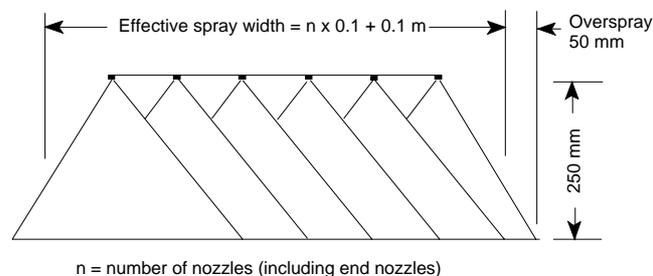


Figure 3 Spraying width with EAN 36 end nozzles

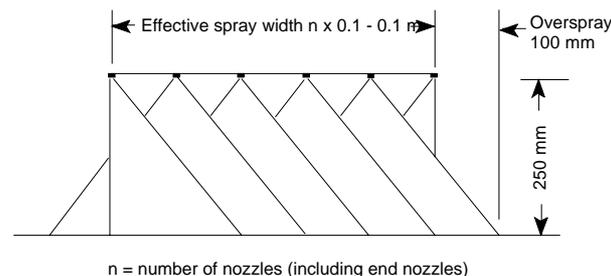


Figure 4 Spraying width with EAN 18 end nozzles

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

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