

# **COMMENTARY TO AG:PT/T535 - CALIBRATION OF BITUMEN SPRAYERS PART 5: ROAD SPEED CALIBRATION**

## **PREFACE**

This test method was prepared by Working Group 3, Sprayer Calibrations Working Group, of the Seal Design Project Group on behalf of Austroads. Representatives of Austroads, ARRB Group and Industry through the Australian Asphalt Pavement Association (AAPA), and the National Association of Testing Authorities (NATA) have been involved in the development and review of this test method.

## **SCOPE**

The procedure described in this test method generally follows the path detailed in NAASRA 1989. The method has been developed as a procedure against which alternative test methods can be verified. The protocol for developing and validating alternative methods is not presented at this stage.

This test method sets out the procedures for determining pump volumetric output plus the transverse distribution of bitumen sprayers and is based on the fixed facility approach using a trough capture system with a low temperature calibrating oil.

## **Further Development**

There are no further plans for the development of this test method.

# CALIBRATION OF BITUMEN SPRAYERS PART 5: ROAD SPEED CALIBRATION

## 1 REFERENCED DOCUMENTS

The following documents are referred to in this method:

### AS/NZS

2341 Methods of testing bitumen and related road making products

### AUSTROADS

Bitumen Sealing Safety Guide 1996

### COPLEY ENTERPRISES

Spraying nozzles

### Main Roads WA

Report 0001R Development of Improved Bitumen tankers and Distributors

### RTA NSW

1260 Performance Requirements for Mechanical Sprayers of Bituminous Materials

### BCA New Zealand

BCA T/1 - T/4 Test Methods for Bitumen Sprayers

### NAASRA

Review of Sprayed Seal Design 1988

Bitumen Sprayers 1989

## 2 EQUIPMENT

### 2.1 *Speed (field calibration equipment)*

See Appendix A for equipment requirements.

## 3 ROAD SPEED CALIBRATION

The accuracy and performance of the distance and road speed indicator equipment fitted to the bitumen sprayer, and the factors required in order to be able to provide the necessary information on the "Bituminous Surfacing Spraying Certificate" must be determined. A check of the performance of the sprayer, and the equipment required to maintain a uniform road speed is required in order to be able to apply bituminous binders at the specified rates of application. See Appendix A for a detailed method and explanation.

## **4 INFORMATION TO BE REPORTED**

Using the procedures outlined in Appendix A, calculate:

- a. For each speed record the time for
  - i. the 250 m distance to the nearest 0.01 second, and
  - ii. the 500 m distance to the nearest 0.01 second.
- b. Actual Speed for each Indicated Speed, for the 500 m distance measurements
- c. A plot of Indicated Speed against the Actual speed.
- d. The Indicated Speed to be used for the range of applications of material.

## **5 PRECISION**

No estimate of precision is currently available.

## APPENDIX A ROAD DISTANCE AND SPEED INDICATOR TEST

### 1 SCOPE

This test method sets out the procedure for assessing the accuracy and performance of the distance and road speed indicator equipment fitted to the bitumen sprayer, and provides a method of calculating the factors required to complete the necessary information on the “Bituminous Surfacing Spraying Certificate”. It also provides a check of the performance of the sprayer, and the fitted equipment required to maintain a uniform road speed within the required range in order to be able to apply bituminous binders at the specified application rates.

### 2 EQUIPMENT

#### 2.1 *Test Strip*

A length of surfaced road pavement meeting the following requirements:

- Reasonably flat, not exceeding 1% grade
- Straight
- No side streets or access/exits which could interrupt the test
- Low traffic volumes (no traffic for the duration of the test is desirable)
- Low speed area (preferably 60 kph or less)
- At least 700 m long

A section of pavement 500 m long with painted, clearly visible, transverse lines at 00 m, 250 m and 500 m. At least 100 m should be available at each end of the measured test strip for the sprayer to start and stop. The measured test lengths shall be accurate to within 100 mm.

#### 2.2 *Timing Equipment*

Two stop watches able to record up to 30 minutes, accurate and readable to 0.01 seconds.

#### 2.3 *Distance Indicator*

The accuracy of the distance indicator is checked by driving the sprayer over the test strip. This shall be carried out twice, once in each direction or twice in the same direction. The lengths measured on each run shall not differ by more than 1 metre. E.g 496.5 m for run 1 and 497.3 m for run 2.

Recorded distance: Calculate the average of the two results and correct to the nearest whole metre.

$$\text{E.g. } (496.5 + 497.3)/2 = 496.9 = 497 \text{ m}$$

Deviation distance = Actual distance - recorded distance

E.g.  $500 - 497 = 3$  m

Percentage deviation = (deviation distance x 100)/(actual distance)

E.g.  $3/500 \times 100 = 0.6\%$ . Accepted, as it is within the  $\pm 2.5\%$  specified tolerance.

Results Calculate the following and record on the Bituminous Surfacing Spraying Certificate

Distance calibration (m) / kilometre

Distance calibration = (Recorded distance x 1000)/ 5000

E.g. for a recorded reading of 497m over the test strip

$$= 497 \times 1000/500 = 994 \text{ m/kilometre}$$

Actual distance (m)

Calculate the factor used to correct the recorded distance to obtain the actual distance sprayed.

E.g. for a recorded reading of 497m over the 500 m test strip, the factor is

$$= 500/497 = 1.006$$

and for a recorded distance of say 310 m the actual distance sprayed is

$$= 310 \times 1.006 = 312 \text{ m.}$$

#### 2.4 Road Speed Indicator

The road speed indicator is tested by driving the sprayer at a series of uniform speeds over the measured test strip. The road speed may be in either metres per minute (m/min) or metres per second (m/s) depending on the particular instrument.

##### Test Speeds

The test speeds must include speeds in the lower range, middle range and higher range to cover the various rates of application of binder specified in sprayed work for priming, primersealing and sealing. The test speeds shall be within the range shown below:

Test Speed Range	
m/min	m/s
60 - 70	1.0 - 1.2
150 - 170	2.5 - 3.0
250 - 270	4.0 - 4.5
350 - 370	6.0 - 6.5
450 - 470	7.0 - 7.5

The road speed is established by starting the sprayer far enough from the test strip to ensure the specified speed is achieved at the start of the test. The timing is commenced (both stop watches) when the sprayer crosses the line with the front wheel or other part of the sprayer easily seen by the tester. One stop watch is used to record the time taken to travel 250 m, and the second watch to record the full 500 m distance.

During the test run the speed indicated should be stable and uniform. If the sprayer cannot maintain a uniform speed, or the instrument cannot maintain a uniform reading, the cause shall be rectified before completing the test.

The time taken to travel the 500 m distance must be twice the 250 m distance  $\pm 1\%$ .

If the deviation is greater, the test must be repeated.

Overall, for a satisfactory speed indicator, the error shall be less than  $\pm 2.5\%$ .

**Results**

- a. For each speed record the time for the 250 m and 500 m distances to 0.01 second
- b. Multiply the time for the 250 m distance by 2 and compare against the time recorded for the 500 m. These values shall be within  $\pm 1\%$ .
- c. For the 500 m distance: calculate the Actual Speed for each Indicated Speed
- d. Plot the Indicated Speed against the Actual speed. This may be done manually using graph paper, or using a computer generated spread sheet and graph. As a general rule, the speeds calculated should give a straight line plot, but there may be some deviation at the low and/or high end of the range depending on the type of instrument used.
- e. From the graph, or spread sheet, determine the Indicated Speed to be used for the range of applications of material specified, and enter these on the Bituminous Surfacing Spraying Table.

E.g. Time for 250 m at an indicated 150 m/min = 1m 43.45 s (103.45 s)

Time for the 500 m = 3 m 26.50 s (206.50 s)

Compare the two: = 103.45 x 2 = 206.90  $\pm$  2.07 s

= 204.83 to 208.97 s

The times are within the accepted tolerance.

Actual speed:  $(500 / 206.5) \times 60 = 145.2$  m/min

## AMENDMENT RECORD

Amendment No.	Clauses amended	Action	Date
1	Commentary Page	New	June 2005
	Footer and header	Format	
	Applied revised test method number	Format	
	Applied new styles	Format	

### Key

Format	Change in format
Substitution	Old clause removed and replaced with new clause
New	Insertion of new clause
Removed	Old clauses removed