

COMMENTARY TO AG:PT/T536 - CALIBRATION OF BITUMEN SPRAYERS PART 6: VISCOSITY OF TEST FLUID DETERMINATION

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 6: VISCOSITY OF TEST FLUID DETERMINATION

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

NAASRA

Review of Sprayed Seal Design 1988

Bitumen Sprayers 1989

3 PROCEDURES

See Appendix A

APPENDIX A

Calibration method and specification for low temperature calibrating oils

For the sprayer calibration to provide adequate measures of equipment performance, the selected test oil must have a working viscosity between the limits 80 and 110 x 10⁻⁶ mm²/s according to the NAASRA Guide *Bitumen Sprayers* 1989.

Note: The NAASRA Guide erroneously listed 10⁻⁶.

These units are for kinematic viscosity (driven by a hydrostatic head) and require a measure of the oils density (0.85 to 0.94 g/mL) for the viscosity to be determined. If a measure of Dynamic viscosity (measured in Pa.s) is used, the range of dynamic viscosity given by:

$$\text{Dynamic viscosity (Pa.s)} = \text{Kinematic viscosity (m}^2\text{/s)} \times \text{Density (kg/m}^3\text{)}$$

and results in the following range for the density and kinematic viscosity limits declared in the original procedure

- for Kinematic Viscosity = 80 x 10⁻⁶ m²/s and Density = 0.85 g/mL
- and for Kinematic Viscosity = 110 x 10⁻⁶ m²/s and Density = 0.94 g/mL

Dynamic Viscosity will be in the range 0.068 Pa.s to 0.103 Pa.s

This can be simplified to a range of 0.07 Pa.s to 0.10 Pa.s

Table A1 Test fluid property specification

Approach	Lower limit	Upper limit
Kinematic Viscometer	80 x 10 ⁻⁶ m ² /s	110 x 10 ⁻⁶ m ² /s
Density	0.85 g/mL	0.94 g/mL
Dynamic Viscometer	0.07 Pa.s	0.1 Pa.s

The temperature of the calibration fluid at the time of testing will influence its viscosity. For accurate determinations, the viscosity of the fluid must be determined at the test temperature and its value be within the acceptable limits.

The precision of the determination does not require the use of exotic viscometers and procedures. The following notes are provided to ensure the appropriate test fluid viscosity is achieved at the time of the sprayer calibration.

A1 Use of a calibrated test fluid (preferred method).

- a. Measure the working temperature of the test fluid with a thermometer accurate and readable to 1°C. Record the test temperature.
- b. Ensure the correct limits are selected from Table A1 (Kinematic or Dynamic measure of viscosity) and that the viscosity of the test fluid has been determined in the appropriate units.

- c. Determine the viscosity of the test fluid at 6 monthly intervals or when the fluid has been contaminated with use. Contamination with kerosene will decrease test oil viscosity and contamination with bitumen may increase its viscosity. The calibration of the test fluid should initially be determined over the range of likely application temperatures. Thereafter, a single test at a representative temperature is required. (25°C is suggested)

A2 Calibration with a calibrated viscometer

Where the viscosity of the test fluid is determined by the calibration facility or its agent, several simple viscometers can be used. Kinematic viscometers are the easiest to use and require the density of the test fluid to be known. The calibration of the viscometer shall be provided by a laboratory with NATA registration for measurement of bitumen viscosity at 135°C or PMBs at 165°C. This method is recommended as an adjunct to method A1, and is particularly valuable as a routine check of test fluid performance between formal calibrations.

- a. Measure the viscosity of the test fluid using the appropriate procedure. Record the value to the nearest 0.01 Pa.s for dynamic measurements, or $1 \times 10^{-6} \text{ m}^2/\text{s}$ where kinematic viscosity is determined. For kinematic viscosity, the density of the test fluid must also be determined to the nearest 0.01 g/mL (only an initial check is required, followed by an annual confirmation thereafter unless gross contamination is suspected).
- b. The calibration of the viscometer should be checked periodically with a fluid of known viscosity (with similar properties to the test oil). This can be provided by an accredited laboratory.

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