

TNZ T/9: 2003

PROCEDURE FOR THE ESTIMATION OF THE KEROSENE CONTENT

1. SCOPE

This document gives a procedure for calculating the lighting kerosene content of cutback bitumen. The grade of bitumen used in the cutback, and the quantity of automotive gas oil and adhesion agent, if present in the cutback, is assumed.

This method applies to cutback bitumens manufactured from bitumen, Automotive Gas Oil (AGO) and kerosene complying with the TNZ M/1 specification, including up to 1.5pph of adhesion agent. Materials containing rheology modifiers, such as polymer modified bitumen, can not be analysed using this procedure.

This method of estimation of has been in use in NZ since the 1960s but has never been formally adopted. It has been common practice to assume that the AGO and adhesion agent content that was specified has been added and report in terms of the “effective” kerosene content that would have been required to obtain the test viscosity.

The formulae allow the calculation of the cutter content in parts per hundred by volume based on the kinematic viscosity at 60°C of the cutback bitumen

Guidelines for methods of sampling and sampling frequencies are given in the NZ Pavement and Bitumen Contractors’ Association “Code of Practice for Quality Assurance for Bitumen”

2. RELATED DOCUMENTS

AS 2341 Methods of Testing Bitumen and Related Road Making Products. Method 3: Determination of Kinematic Viscosity by Flow Through a Capillary Tube

ASTM D2170 Standard Test Method for the Kinematic Viscosity of Asphalts (Bitumens)

NZ Pavement and Bitumen Contractors’ Association “Code of Practice for Quality Assurance for Bitumen”

3. SAMPLING

The following information shall be provided with each sample submitted for testing:

- The source of the cutback bitumen sample
- The name of the person taking the sample
- The sampling method used, if any.
- The grade of the bitumen used to manufacture the cutback
- The blended proportions of AGO, kerosene and adhesion agent in parts per hundred of the bitumen by volume at 15° C.
- The commercial name of the adhesion agent

4. PROCEDURE

Determine the kinematic viscosity (V) of the test sample using the test methods listed under related documents.

5. CALCULATION

Calculate the effective kerosene content as follows:

$$K = \frac{1}{(\log \log V + C_K)} [B - (\log \log V + C_D)(D + A) - 100 \cdot \log \log V] \dots \dots \dots (1)$$

where: V is the kinematic viscosity of the cutback bitumen at 60° C, in units of mm²/s (cSt)

K is the effective kerosene content in parts per hundred (pph) of the bitumen, by volume at 15° C

D is the AGO content in parts per hundred of the bitumen by volume at 15° C

A is the adhesion agent content in parts per hundred of the bitumen at 15° C, preferably by volume but mass values at typical dosage rates are sufficiently accurate

B is a constant depending upon the viscosity of the bitumen in the cutback

C_K and C_D are constants that depend on the crude oil from which the bitumen has been manufactured, the manufacturing process and the grade of the bitumen.

Note: see Table 1 for numerical values for the equation constants For Marsden Point refined bitumen

Table 1: Standard Constants

Bitumen Grade	B	C _K	C _D
B180	67.44	0.42	0.19
B130	69.37	0.42	0.19
B80	72.29	0.42	0.19
B60	74.51	0.42	0.19

Note: Where the bitumen is imported the importer should confirm the constants to be used.

6. REPORTING

Report the following:

- All sample information as required by section 5 above.
- The measured kinematic viscosity in mm²/s @ 60° C of the cutback sample.
- The estimated kerosene content of the cutback calculated using equation 2, to the nearest 0.1 pph by volume.

7. PRECISION

Formal precision trials have not been carried out but the precision has been estimated based on the variation of bitumen viscosity and the precision of the viscosity test.

The constant B is the log log of the viscosity of the base bitumen at 60°C. If this base viscosity is known it can be substituted for B. The base viscosity is the major source of “error” in the estimation especially at low diluent contents where the base viscosity will dominate. For imported bitumen the value should be confirmed by the bitumen supplier.

The precision of the method is therefore associated with the base viscosity and the precision of the viscosity test. When the results are based on one test on one sample then the estimated precision is ± 2pph of kerosene.