Transport Roads & Maritime Services

NSW GOVERNMENT

# Test method T659

## Methylene blue adsorption value of road construction material

**NOVEMBER 2012**

# Revision Summary

| Ed/Rev Number | Clause Number | Description of Revision | Authorisation | Date |
|---|---|---|---|---|
| Ed 1/Rev 0 | All | New Issue | J Friedrich | June 2009 |
| Ed 2/ Rev 0 | All | Reformatted RMS template | J Friedrich | November 2012 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T659 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

# Test method T659

# Methylene blue adsorption value of road construction material

## 1. Scope

This test method sets out the procedure to determine the methylene blue adsorption value (MBV) of road construction material.

*NOTE: The Test Method is based on the International Slurry Surfacing Association (ISSA) Technical Bulletin №145. The sieve sizes have been changed to AS equivalents.*

## 2. General

(a) The method is used to quantify the amount of harmful constituents by its surface area (i.e. smectitie group of clays, organic matter, and iron hydroxide) present in the -75 μm fraction of road construction material

(b) A duplicate pair of results is determined

(c) The test includes the following steps:

(i) Prepare the fraction and disperse in a small amount in water

(ii) Use a known concentration of methylene blue (MB) solution to titrate stepwise against the fine aggregate suspension

(iii) The methylene blue dye is precipitated onto the surface of the harmful constituents. When no more dye can be adsorbed by the material the blue colour can be seen in the aqueous phase

(iv) Observe the behaviour of drops of solution on filter paper until a defined colouration and pattern is observed as the end point

## 3. Apparatus

(a) A thermostatically controlled oven(s), with good air circulation and capable of controlling a temperature not to exceed 80°C

(b) Burette of suitable capacity mounted on a titration stand

(c) Beakers of approximately 250 mL capacity

(d) Volumetric flask 1000 mL capacity

(e) Calibrated timing device (e.g. stop watch)

(f) (Option) Pipette marked in 0.5 mL increments

(g) A balance of suitable capacity with a limit of performance of ±0.01 g

(h) Magnetic stirrer with stir bar or variable speed mixer capable of about 700 RPM

(i) Glass stirring rod about 8 mm diameter and 250 mm in length

(j) Sieves of suitable size down to 75 μm that conform to AS 1152

(k) The following general purpose laboratory reagent (or better quality) is required for the test:

(i) Methylene Blue

(l) Expendable laboratory products:

(i) 8 μm ashless general purpose filter paper (e.g. №40 Whatman)

(ii) Distilled or deionised water at a temperature of 23°±2 C

## 4. Preparation

(a) Sample the separate components and prepare a sample of fine material as follows:

*NOTE: A single component can be tested to identify the source of harmful constituent. Report the component tested.*

(i) Combine the components in the proportion defined in the mix design but without components excluded by the specification

(ii) Divide the sample to provide about 100 g. Place the container and sample in the oven at 75°±5 C for at least 1 h

*NOTE: Drying at over 80°C alters materials containing gypsum or organic matter.*

(iii) Dry the sample to Constant Mass in an oven at 75°±5 C:

- Remove the container with sample from the oven and stand until cool to touch
- Determine the mass. Compare successive mass determinations. Constant mass has been achieved if the change in mass from successive determinations is within 0.1%
- Otherwise return the container and sample to the oven for a further period of at least 30 min and repeat Step (iii)

(iv) Screen the sample through the 75 μm AS sieve. Use guard sieves to prevent overloading the 75 μm AS sieve

(v) Retain the portion passing the 75 μm AS sieve and discard the remainder

(b) Prepare the MB solution by dissolving 1.00 ±0.05 g of methylene blue in a flask with 1000 ± 1 mL of distilled or deionised water

*NOTE: The aliquot is that 1 mL of MB solution contains 1 mg of methylene blue. Seal the MB solution for re-use but discard when more than 6 months old.*

## 5. Procedure

(a) Either weigh out 30.0 ±0.5 g of distilled or deionised water into a beaker or use a pipette to add 30 ±0.5 mL of water to the beaker

(b) Divide the fraction passing the 75 μm AS sieve and weigh out 1.00 ±0.05 g

(c) Add the fraction to the beaker and stir for at least 1 min and until the suspension is dispersed

*NOTE: A magnetic stirrer is satisfactory.*

(d) Add 20 mL of the MB solution to the burette. Select suitable increments of MB solution for the titration so that the increment added to achieve the initial end point is no more than 0.5 mL

*NOTE: An initial titration can be performed to estimate the quantity to achieve the initial end point.*

(e) The MB solution is titrated stepwise:

(i) Continually stir the suspension during the titration

(ii) Add the suitable increment of MB solution from the burette into the fine aggregate suspension while stirring

(iii) After 60 ± 5 s from adding the MB solution, take a small drop of solution using the glass rod and place on the filter paper. Sequentially place the drops on the filter paper at a spacing that does not overlap. Record near the drop the cumulative volume of MB solution added in mL

(iv) Inspect the drop on the filter paper for the following

- Initially a well defined circle of methylene blue stained dust forms and is surrounded by a corona (i.e. outer ring) of clear water
- Progressively the MB dye is adsorbed by the solids but the corona remains clear
- A permanent light blue colouration of the halo in the corona of previously clear water indicates the initial end point
- After the end point is reached the corona becomes more distinctly blue when there is free MB

(v) Repeat Steps 5(e)(i) to (iv) until the initial end point is reached

(vi) Without adding more MB solution, at about 30 s after the initial end point, take a small drop of solution using the glass rod and place on the filter paper. Repeat this Step a further 4 times. If the colour becomes clear, add 0.5 mL of MB solution and repeat this Step

(f) Inspect the drops of suspension on the filter paper to verify the end point. For the drop that indicates the end point, record the corresponding cumulative volume of MB as the Methylene Blue Value (*MBV*)

*NOTE: As 1 mL of MB solution contains 1 mg of methylene blue, the volume of MB is in mg and there is 1 g of fraction being tested.*

(g) Repeat Step 4(b) to determine the result for a duplicate

## 6. Calculations

There are no calculations.

## 7. Reporting

Include the following results in the report:

(a) Report the sample details

(b) Report the Methylene Blue Value (*MBV*) in mg/g to the nearest whole number for each determination and the average

(c) Reference to this test method

RMS 12.696