



Test method T623

Binder content and grading of cold mix

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Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Generally Revised	D.Dash	July 1999
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 T623 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T623

Binder content and grading of cold mix

1. Scope

This test method sets out the procedure to determine the residual binder content and grading of cold mix by the reflux method.

2. Apparatus

- (a) 2 L Erlenmeyer flask with a reflux condenser or a suitable glass funnel and a stopper.
- (b) A thermostatically controlled hot plate with a heat diffusion cover.
- (c) A balance of suitable capacity with a limit of performance of 0.005 g.
- (d) Suitable centrifuge.
- (e) Suitable small metal containers (60 mL) with lids.
- (f) Suitable laboratory tongs and gloves.
- (g) AS1152 sieves and a sieve cleaning brush.
- (h) Suitable metal dishes.
- (i) Suitable steel tray, trowel, spatula and scoop for mixing.
- (j) Suitable quartering equipment.
- (k) A suitable fume cupboard.
- (l) Toluene (commercial grade).

3. Preparation of Sample

Transfer the sample to the mixing tray, break up any lumps, mix well and reduce the size of the sample by quartering to the following minimum amounts:

Nominal Size of Mix (mm)	Minimum Weight of Test Sample (g)
< 10	600
10-20	800
> 20	1000

4. Procedure

4.1 Volatile content

Determine the volatile content (V) of the mix in accordance with Test Method T622.

4.2 Determination of bitumen content

- (a) Determine the weight of the flask and stopper (M_3) to the nearest 0.1 g.
- (b) Place/slide the test sample gently into the flask, fit the stopper and determine the weight (M_1) to the nearest 0.1 g.
- (c) Add sufficient toluene to cover the test sample by a depth of 25 mm. Fit the reflux condenser or glass funnel.
- (d) Gently warm the contents until the vapours start to condense and continue to reflux for 1 hour without evaporating any solution. Swirl the contents in the flask at intervals to prevent the bitumen baking onto the bottom.

Note: For mixes containing highly absorptive aggregates it may be necessary to reflux the mix for up to 8 hours (without evaporating any solution) to extract all the absorbed or occluded bitumen.

- (e) Remove the flask from the hot plate and with the reflux condenser or glass funnel still in position, allow to cool to room temperature.
- (f) When cool remove the condenser or glass funnel, fit the stopper and determine the weight (M_2) to the nearest 0.1 g.
- (g) Shake the flask and contents and pour about 20 mL into each of four centrifuge tubes and centrifuge for about 15 minutes (See Notes).

Note: The quantity used should be sufficient to leave 1 g of binder when the solvent is evaporated.

The time and speed of centrifuging is best determined by trial. Excessive centrifuging should be avoided and only conditions that ensure the suspended mineral matter is ash free be chosen.

When decanting the liquid from the tube do not drain off the entire liquid from the residue

- (h) Weigh a small metal container with lid and record the weight (M_6) to the nearest 0.001g.
- (i) Pour the free liquid from two tubes into the small metal container without disturbing any deposited mineral matter and refit the lid immediately. Label sample A.
- (j) Weigh sample A and record the weight (M_4) to the nearest 0.001 g.
- (k) Repeat steps (g) to (i) for second sample B.
- (l) Note: A control test shall be conducted on a solution of approximately 5 g of bitumen mixed in 100 g of toluene. The grade of bitumen used is to be the same or similar to that of the bitumen used in the test sample. The result of the control test should be within 0.1% of the theoretical amount of bitumen.
- (m) Place the lid on the base of each metal container.
- (n) Place each sample on a hot plate covered with a heat diffusion cover and carefully evaporate most of the solvent without boiling. Continue evaporation until the formation of an immobile film of bitumen is evident.
- (o) Remove the lid from its container and replace the container on the hot plate.
- (p) Continue evaporation until the bitumen just begins to fume. During this last stage, manipulate the container with tongs to control the heating and distribute the bitumen. Allow a faint degree of fuming to continue for 30 seconds.
- (q) Remove the container from the hot plate, fit the lid, allow to cool to room temperature and determine the weight (M_5) to the nearest 0.001 g.

4.3 Determination of the Particle Size Distribution

- (a) Clean the aggregate remaining in the flask by successive washing and decanting over a 75 μ m sieve until the washing's are essentially colourless. All filler and aggregate particles adhering to the flask and 75 μ m sieve are to be washed carefully into the test sample.
- (b) Place the washed test sample on the hot plate until dry.
- (c) Weigh and record the weight to the nearest 0.1 g.
- (d) Determine the particle size distribution in accordance with T201.

5. Calculations

- (a) Total weight of binder in test sample.

$$M_b = \frac{(M_2 - M_1) \times (M_5 - M_6)}{(M_4 - M_5)} \text{ (g)}$$

- (b) Total weight of test sample.

$$M_s = M_1 - M_3 \text{ (g)}$$

- (c) Weight of test sample less volatiles (Determined from T622)

$$M_{s-v} = M_s - \frac{V \times M_s}{100} \text{ (g)}$$

- (d) Residual binder content per 100 parts of mix.

$$RB = \frac{M_b}{M_{s-v}} \times 100 \text{ (\%)}$$

Where:

M_1 = Wt. of flask sample and stopper (g)

M_2 = Wt. of flask sample and stopper after refluxing (g)

M_3 = Wt. of the flask and stopper (g)

M_4 = Wt. of sample in small metal container plus lid, before evaporation (g)

M_5 = Wt. of sample in small metal container plus lid, after evaporation (g)

M_6 = Wt. of sample in small metal container and lid (g)

M_{s-v} = Wt. of test sample less volatiles (g)

M_s = Total Wt. of test sample (g)

M_b = Total Wt of binder in test sample (g)

V = Percentage of volatiles as determined in T622 (%)

RB = Residual binder content per 100 parts of mix (%)

6. Reporting

- (a) Report the binder content based on 100 parts of mix to the nearest 0.1 %.
- (b) Report the percentage of aggregate passing each sieve to the nearest 1.0%, except for the minus 0.150 mm which is to be reported to the nearest 0.1 %.