



Transport
Roads & Maritime
Services

Test method T230

Resistance to stripping of aggregates and binders

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Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D.Dash	May 1999
		Date on Test Method Revised to Agree with Date on Revision Summary	D.Dash	Feb 2001
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

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

The most recent revision to Test method T230 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T230

Resistance to stripping of aggregates and binders

1. Scope

- (a) This test method sets out the procedures for the preparation and curing of test samples, and the assessment of resistance to stripping in the presence of moisture of samples of aggregates (with or without treatment with precoating materials) from bituminous binders (with or without the addition of binder adhesion agents).
- (b) This method is also known as the Plate Test or Stripping Test. It is not applicable to aggregate particles which pass a 9.50 mm Australian Standard Sieve.

Note: When performing T230 using modified binders, the softening point by Test Method T505 must first be determined.

2. Apparatus

- (a) Zinc or aluminium plates, of nominal size 152 mm by 152 mm, 3 mm thick with a 6 mm rim turned up on all sides, with an etched upper surface.
- (b) Hot plate, electric, with adjustable temperature control
- (c) A thermostatically controlled oven with good air circulation, capable of maintaining a temperature within the range of $60^{\circ} - 110^{\circ} \pm 2^{\circ} \text{C}$
- (d) A thermostatically controlled oven with good air circulation capable of maintaining a temperature within the range of $185^{\circ} \pm 5^{\circ} \text{C}$. This oven is only required where binder adhesion agents are to be tested.
- (e) A thermostatically controlled water bath, capable of maintaining water at a temperature within the range of $50^{\circ} \pm 2^{\circ} \text{C}$, and being adjustable to maintain a temperature of $24^{\circ} \pm 2^{\circ} \text{C}$ fitted with a water circulating device and racks to support metal plates below water level.
- (f) A balance of at least 6000 g capacity, readable and accurate to 1 g
- (g) Containers of at least 500 mL capacity, with press-on lids
- (h) Pliers, long nose, with hollow-ground tips
- (i) Heat insulating gloves (e.g. Ansell industrial neoprene "Neotop 75" or equivalent) and tongs.
- (j) Spatula or palette knife
- (k) 9.5 mm sieve complying with AS 1152.

3. Test Samples

- (a) Each aggregate test portion shall consist of at least 50 particles of a similar size representing the aggregate sample submitted for testing. In general, five test portions are required per sample.

Note: The test portion is readily obtained from sealing aggregates; however, to obtain it from asphalt aggregates, screening of a larger quantity of the sample to obtain the +9.5 mm fraction may be required.

- (b) The binder should be a sample of the type and class from the same source of supply or manufacture as the binder proposed for use in the field. The binder may consist of bitumen, scrap rubber bitumen or polymer modified bitumen. The client shall specify the type, class and source of the binder to be used.
- (c) Precoating Material and Binder Adhesion Agents should be from materials which comply with specifications 3258 or 3268 and 3259 or 3269 respectively unless tests are being conducted to evaluate such materials. Precoating materials and bitumen adhesion agents should be prepared and used in the proportions as recommended by the manufacturer unless otherwise specified.

4. Preparation of Test Samples

4.1 Aggregates

4.1.1 Surface conditions

- (a) Unless otherwise specified or approved, each aggregate sample submitted for test shall be prepared in the following conditions:
 - (i) As received
 - (ii) Clean and Dry the aggregate particles shall be washed and scrubbed, if necessary, to remove adhering dust, and dried to constant mass in an oven at a temperature in the range of 105°C to 110°C.
 - (iii) Dusty the aggregate particles shall be lightly sprinkled with dried clay screened to pass a 75 µm sieve. Excess dust should be shaken from the particles before applying the aggregate particles to plates.
 - (iv) Saturated, Surface Dry the aggregate particles shall be soaked in water at room temperature for 24 hours allowed to drain for about 15 minutes then spread on an absorbent cloth and rolled or patted until all visible films of water are removed. Larger particles may be wiped individually.
 - (v) Saturated, Surface Wet the aggregate particles shall be soaked in water at room temperature for 24 hours and then allowed to drain for 15 minutes before applying the aggregate particles to the plate.

4.1.2 Precoating

- (a) Precoating is only applicable to cover aggregates for sealing.
- (b) Unless otherwise specified or approved the precoating material should be prepared and/or applied in accordance with the manufacturer's recommendations:
- (c) The aggregate test portion, prepared in accordance with the appropriate method set out in Clause 4.1.1 above, shall be placed in the 500 mL container and the precoating material added in small increments. After each addition the container should be sealed and shaken or rolled to mix the precoating onto the aggregate particles. Continue adding and mixing small increments until the aggregate particles have a dull damp appearance without any inundation.
- (d) Remove the precoated aggregate from the container and allow the aggregate to stand on a tray or in a flat dish for 24 hours before applying the aggregate particles to plates.

4.2 Binder Adhesion Agents

WARNING: Hot binders can cause burns. Handle with gloves or tongs. Suitable safety glasses and/or face shields are to be worn.

Adhesion agent may be added to binder for sealing and asphalt application.

Unless otherwise specified or approved the binder adhesion agent should be prepared and/or used in the proportions recommended by the manufacturer.

- (a) Weigh out sufficient binder for the number of plates allowing approximately 35 g for each plate. Determine the mass of binder to the nearest 1 g and calculate the quantity of adhesion agent as a percentage by mass.
- (b) Gently warm the binder until fluid and add the adhesion agent. Stir the mixture at frequent intervals until the temperature of the mixture reaches 180°C. Place the mixture in an oven at a temperature within the range of 185° ± 5°C. Allow the mixture to remain in the oven for 60 ± 2 minutes. Remove the mixture from the oven and allow to cool to room temperature.

5. Procedure

- (a) Gently heat binder on the hotplate until fluid
- (b) Place a zinc or aluminium plate on the balance. Pour the fluid binder on to the plate until 30 to 35 g has been spread.
- (c) Remove the plate from the balance and gently heat on a hot plate to ensure a uniform thickness of the binder film. Allow the plate and binder to cool to room temperature.
- (d) Gently hand press the 50 aggregate particles (test portion) into the binder film on the plate. Place the plate into an oven at $60^{\circ} \pm 2^{\circ}\text{C}$ or at [Binder Softening Point + 20°C] $\pm 2^{\circ}\text{C}$ whichever is the higher, for 24 hours.
- (e) Remove the plate containing the binder and aggregate particles from the oven and immerse in the water bath at $50 \pm 2^{\circ}\text{C}$ for 4 days.
- (f) After 4 days the temperature of the water in the water bath shall be lowered to $24 \pm 2^{\circ}\text{C}$ and maintained at this temperature for one hour, or transfer the plate to another container of water at $24 \pm 2^{\circ}\text{C}$ for one hour.
- (g) Remove the plate and contents from the water bath and pull the aggregate particles from the binder with the aid of long-nosed pliers. Use steady vertical pressure when pulling the aggregate particles to avoid sliding the particles while manipulating the pliers.
- (h) Sort the aggregate particles into groups according to the following features:
 - (i) *Completely Stripped* - less than one quarter of the contact area is coated with binder.
 - (ii) *Partly Stripped* - between one quarter and three quarters of contact area is coated with binder.
 - (iii) *Not Stripped* - more than three quarters of the contact area is coated with binder.

Note: The black binder on the contact surface may be very thin. To confirm the presence of binder, place a filter paper (Whatman No 1) over the contact area of the inverted aggregate particle and apply firm pressure with the index finger. Lift the filter paper by its edges. If the aggregate is lifted with the filter paper and remains attached to the paper for greater than 5 seconds a binder film is present. When using scrap rubber bitumen, the binder film remaining on the aggregate may be thinner than that usually encountered with other binders.

6. Calculations

- (a) After visual assessment of each aggregate particle, calculate the percentage of particles (by number) which have stripped as follows:
 - Completely Stripped - count one unit
 - Partly Stripped - count one-half unit
 - Not Stripped - count nil
- (b) The percent stripping of the sample is the sum of these percentages calculated to the nearest two percent.

7. Reporting

Report the following:

- (a) Type and source of aggregate.
- (b) Type, class and source of binder.
- (c) Softening Point of Binder (T505) and oven temperature for 24 hour conditioning.
- (d) Precoating material.
- (e) Type and proportion of binder adhesion agent.
- (f) Percent Stripped to the nearest 2%.
- (g) Report any tendency for aggregate particles to crumble when being pulled from plate.