Transport Roads & Maritime Services

NSW GOVERNMENT

Test method T186

Erodibility of stabilised road construction materials

OCTOBER 2012

Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
Ed 1 / Rev 0	All	New Method. Consistent with T130 & T131. Incorporate comments by A Bretreger. Surcharge 6.75kg.	D Hazell	September 2008
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 T186 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T186

Erodibility of stabilised road construction materials

1. Scope

This test method sets out the procedure to determine the erodibility (erosion rate) of road construction material blended with a cementitious binder.

2. General

(a) The test is performed on material:

(i) Passing the 19.0 mm AS sieve

(ii) Blended in the laboratory with cementitious binders

(b) A pair of specimens is tested unless otherwise specified

3. Apparatus

(a) A cylindrical metal mould with an internal diameter of 152 ± 1 mm and internal height of 178 ± 1 mm

(b) A metal extension collar approximately 50 mm high and a perforated metal base plate approximately 10 mm high, both of which can be firmly attached to, or removed from, the mould. Evenly distributed over the base plate shall be a minimum of 20 perforations of 3 ± 0.2 mm diameter

(c) A metal spacer disc of 150 ± 0.5 mm diameter and 61 ± 0.25 mm thickness

(d) A metal perforated plate of 150 mm ± 0.5 mm diameter fitted with a metal stem. The total mass of the perforated plate and stem shall be 1.0 ± 0.025 kg. Evenly distributed over the perforated plate shall be a minimum of 42 perforations of 3.0 ± 0.2 mm diameter

(e) One annular metal surcharge and two slotted metal surcharge, each having a mass of 2.25 ± 0.025 kg and a diameter of 150 ± 0.5 mm with a central hole diameter of 55 ± 1.0 mm

(f) Filter papers, coarse, nominal 150 mm diameter

(g) A metal rammer with a 50 ± 0.4 mm face diameter, a drop mass of 2.7 ± 0.01 kg and equipped with a suitable device to control the height of drop to a free fall of 300 ± 2.0 mm

NOTE: A suitable form of hand apparatus is shown in Figure 2 of AS 1289.5.1.1. Provided the essential dimensions are adhered to, mechanical forms of the apparatus may be used.

(h) A rigid foundation to compact the specimen on (e.g. a concrete floor or a concrete block of at least 100 kg) with suitable attachments for firmly holding the mould base plate assembly during compaction

(i) A jack, lever and frame or other device suitable for extruding compacted specimens from the mould.

NOTE: Apparatus (a) to (i) as per T117 for CBR.

(j) A thermostatically controlled oven with good air circulation, which can be maintained at 65°C ± 5°C for accelerated curing

(k) A thermostatically controlled oven with good air circulation, which can be maintained at 105°C to 110°C for drying

(l) A vibrating table with a frequency of 160 Hz and acceleration when empty of ± 13 G

(m) A balance of at least 15 kg capacity with a limit of performance of not greater than ± 5g

(n) A balance of at least 500 g capacity with a limit of performance of not greater than ± 0.01g

(o) Timer readable in seconds

(p) Mixing apparatus such as a trowel and quartering apparatus such as metal plates approximately 400 mm by 125 mm and 200 mm by 125 mm

(q) A bowl suitable for thoroughly mixing increments of water with the sample. A mixing machine (approximately 11 litre capacity) may be used

(r) A scarifying tool

(s) A steel straightedge, about 300 mm long, about 25 mm wide and about 3 mm thick, preferably with a bevelled edge

(t) A 300 mm ruler

(u) Wrapping for curing specimens (e.g. newspaper, plastic bags, foil)

(v) Sealable airtight containers suitable for curing moist samples

(w) Dishes of suitable size

(x) A watertight metal cylindrical container with an internal diameter of 200 ± 2mm and height of 250 ± 2 mm and fitted lid

(y) A graduated measuring cylinder with minimum capacity of 250 mL

(z) Two metal containers, minimum capacity 4 litres

(aa) 2.36 mm AS sieve

(bb) Quick set epoxy adhesive

4. Preparation of Samples

(a) Samples shall be prepared in accordance with T105

(b) Prepare the binder quantities for the sample in accordance with T105

5. Procedure

The test is subject to the time constraints in Table 1 unless otherwise specified

5.1. Add Binder and Moisture

(a) Remove the sample from the sealed container

(b) Add the required mass of binder (M_B) calculated in T105. Mix the sample and record the time at the commencement of mixing

(c) Immediately adjust the moisture content to OMC ±0.5% as determined by T130. Thoroughly mix the sample

NOTE: The calculation for the quantity of water is according to T105 Process (A.9).

(d) Store the sample in a loose state in a sealed container at 23° ± 2°C and cure for the period for the type of binder shown in Table 1

NOTE: If stored at a temperature outside the specified range, record and report the temperature.

Table 1 - Time Constraints

Test Method Step	Description	Time constraint (i)	
		Fast Setting Binder (Working time < 4 hrs)	Slow Setting Binder (Working time > 6 hrs)
1.1.1(b)	Incorporate binder into each sample.	Start of timing	Start of timing
1.1.1(d)	Curing period.	Approximately 15 mins after incorporating binder	Approximately 1 hr after incorporating binder
5.2(f)	Complete moulding of sample.	Within approximately 30 mins after incorporating binder	Within approximately 1¼ hrs after incorporating binder

NOTE: (i) working time as defined in T147.

(e) Repeat Step 5.1 for each additional sample.

5.2. Moulding

(a) Determine the mass of the mould (M_1) in grams

(b) Clamp the mould, with extension collar attached, to the base plate. Insert the spacer disc and place a coarse filter paper on top of the spacer disc

(c) Remove the sample from the container after the time specified in Table 1 and thoroughly remix the sample

NOTE Take care to avoid loss of moisture during moulding.

(d) Compact the sample in the mould using the compaction as specified in the following table (i.e. number of equal layers and each layer subject to a uniformly distributed number of blows from the required rammer falling freely from the height). Do not vary the compacted thickness of each layer by more than 5 mm. Scarify the surface of the compacted layer to a depth of approximately 5 mm prior to placing the next layer

Item	Standard Compaction
No. of layers	3
Rammer drop mass (kg)	2.7 ± 0.01 kg
Height of drop	300 ± 2.0 mm
No. of uniformly distributed blows per layer	53

NOTE: Use only sufficient material to slightly overfill the mould leaving not more than 5 mm to be struck off after removing the collar. If overfilled by more than 5 mm or under filled, the specimen is to be replaced by a new specimen

(e) Free the material from around the collar and then carefully remove the collar

(f) Level the specimen to the top of the mould by means of the straightedge. Patch any holes developed in the surface using a slurry made from some of the excess material and trowel the slurry on the top surface of the specimen to provide as smooth and level a surface

(g) Determine the moisture content (w) in accordance with T120, T121 or T180

(h) Remove the perforated base plate and spacer disc. Determine the mass of the mould plus compacted specimen and record the mass (M_3) in grams

(i) Eject the specimen from the mould. Mark the bottom surface (i.e. the underside of the first layer compacted)

(j) Repeat processes Steps 5.2(b) to (i) for each additional specimen

NOTE: Provided care has been taken to avoid loss of moisture during moulding of the first specimen the moisture content determination in Step (g) may be omitted for additional specimens.

5.3. Curing of Specimens

(a) Wrap specimens to keep them moist during curing and to ensure that they do not dry out

NOTE: Wrap the specimen in wet newspaper, seal in plastic bags or foil. Take care to avoid damage to the specimen.

(b) Place the specimens in an oven capable of maintaining a temperature of 65°C ± 5°C and cure for 7 days ± 6 hours (i.e. accelerated curing)

5.4. Specimen Preparation Prior to Testing

(a) Remove the specimen from the curing environment and remove wrapping. Inspect the specimen and record if either specimen has dried out. If necessary, allow the specimen to cool

(b) Pour water into a metal tray to a depth of 25 mm and place the specimen bottom down in the tray. Leave the specimen in the water for 1 hour

(c) While the specimen is standing in water:

(i) Apply a uniform coating of quick set epoxy adhesive over the top surface of the specimen

(ii) Place the surcharge holder centrally over the top surface of the specimen and seat firmly into the epoxy

(iii) Allow the epoxy to set

(d) Repeat Step 5.4 for each additional specimen

5.5. Erosion Testing

(a) Determine the mass to the nearest gram of the metal container (M_5) that will be used to collect the sieved wash water in Step 5.5(h)

(b) Secure the metal watertight container (200 mm diameter) to the vibrating table

(c) Pour 200 ± 10 mL of water into the watertight container. Provide a total surcharge mass of 6.75 ± 0.1 kg. Place the specimen and surcharge into the watertight container with water

NOTE: Take care not to damage the specimen when placing it into the watertight container.

(d) Vibrate the specimen for 15 min ± 0.5 min

(e) At the end of the vibration period, remove the watertight container from the vibrating table

(f) Remove the surcharge and remaining portion of specimen from within the watertight container

(g) Gently wash the watertight container and any adhering fines from the remaining portion of specimen and collect in the metal container

NOTE: Take care not to further erode the specimen.

(h) Wet sieve the wash water over a 2.36 mm AS sieve into the metal container

(i) Determine the dry mass of the material retained (M_7) to the nearest gram and record

(j) Place the metal container with the sieved wash water into the oven at 105º to 110ºC and dry to Constant Mass according to T120

(k) Determine the mass of metal container plus fines (M_6) to the nearest gram.

(l) Repeat Step (d) for each additional specimen

6. Calculations

(a) Calculate the dry density of the specimen as follows

$$DD = \frac{(M_3 - M_1)}{V} \times \frac{100}{(100 + w)}$$

Where:

DD = Dry Density (t/m³)

M_3 = Mass of mould and compacted specimen (g)

M_1 = Mass of mould (g)

V = Effective volume of the mould (mL)

w = Moisture content at time of moulding (%)

(b) Calculate the mass of eroded fines (M_F) as follows

$$M_F = (M_6 - M_5)$$

Where:

M_F = Mass of eroded fines (g)

M_6 = Mass of metal container plus fines (g)

M_5 = Mass of metal container (g)

(c) Calculate the erodibility value (E) as follows

$$E = \frac{M_F}{15}$$

Where:

E = Erodibility value (g/min)

M_F = Mass of eroded fines (g)

7. Reporting

Include the following data and results in the report:

(a) Type, sources and percentage of binder used to the nearest 0.1% (%)

(b) Period and condition of curing

(c) Condition of specimens after curing (i.e. moist or dry)

(d) Maximum Dry Density to the nearest 0.01 t/m³

(e) OMC (to nearest 0.1%)

(f) Moisture content at which specimens were compacted (to nearest 0.1%)

(g) Dry density of specimens as moulded (to the nearest 0.01 t/m³)

(h) The erodibility value (E) in g/min for each specimen to the nearest whole number

(i) Average erodibility in g/min for the pair of specimens to the nearest whole number

(j) Reference to this test method

RMS 12.423