Transport Roads & Maritime Services

NSW GOVERNMENT

Test method T204

Los Angeles test for coarse aggregates

OCTOBER 2012

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 T204 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T204

Los Angeles test for coarse aggregates

1. Scope

This test method sets out the procedure to be used for testing crushed rock, crushed slag, uncrushed gravel and crushed gravel intended for road making and other purposes, using the Los Angeles testing machine. It may also be applied to crushing's derived from rock spalls. The method is derived from that set out in Australian Standard 1141.23.

2. Apparatus

(a) A Los Angeles machine and steel balls as specified in AS1141.23

(b) A balance of 10 kg capacity, accurate and readable to 1 g

(c) 37.5 mm, 26.5 mm, 19.0 mm, 13.2 mm, 9.50 mm, 6.70 mm, 4.75 mm, and 1.70 mm AS sieves, 300 mm diameter

(d) 9.66 ± 0.20 mm and 6.81 ± 0.10 mm slotted sieves conforming to requirements of AS1141.15

(e) Metal dishes or other suitable containers

(f) A metal mixing and quartering tray

(g) Quartering apparatus, such as metal plates 40 cm long by 12 cm high

(h) Sample dividers (riffle boxes) of appropriate size openings, e.g. the multiple slot type similar to those shown in AS1289 (optional)

(i) A thermostatically controlled oven with good air circulation, capable of maintaining temperature within the range of 105°C to 110°C

3. Selection of Test Grading

The test portion shall consist of a combination of aggregate fractions obtained by sieving, washing and riffling or quartering representative material to comply with a grading given in Table 1.
Where aggregates, crushed rock or gravel are submitted for testing, the Los Angeles value test grading (see Table 1 or 2) nearest to the grading of the actual material supplied shall be selected. It is assumed that the shape of the particles is similar to that of the material proposed for use. For crushing from rock spalls the test portion is prepared to comply with the B-25 percent flaky particles grading (see Table 3).

4. Preparation of Test Portions

(a) Prepare the required unwashed amount of each fraction (see Table 1, 2 or 3) by sieving representative material on appropriate sieves by hand or in a mechanical shaker.

Table 1

Los Angeles Value Preferred Test Gradings

Test Grading	Material Size	Mass of Unwashed Fraction	Desired Mass of Washed Fraction	Total Mass of Test Sample (m_1)	Steel Balls	
					Number	Total Mass
	mm	g	g	g		g
B	19.0 13.2 13.2 9.50	2600 ± 50 2600 ± 50	2500 2500	5000 ± 10	11	4584 ± 25
K	9.50 4.45	5100 ± 50	5000	5000 ± 10	7	2915 ± 20

Note: B and K are the preferred test gradings as the results obtained using these gradings are usually similar to each other. these gradings are appropriate to commonly used sealing aggregate sizes.

Table 2

Los Angeles Value Alternative Test Gradings

Test Grading	Material Size	Mass of Unwashed Fraction	Desired Mass of Washed Fraction	Total Mass of Test Sample (m_1)	Steel Balls	
	mm	g	g	g	Number	Total Mass g
A	37.5 26.5 26.5 19.0 19.0 13.2 13.2 9.50	1350 ± 25 1350 ± 25 1350 ± 25 1350 ± 25	1250 1250 1250 1250	5000 ± 10	12	5000 ± 25
H	19.0 13.2	5100 ± 50	5000	5000 ± 10	12	5000 ± 25
J	13.2 9.50	5100 ± 50	5000	5000 ± 10	10	4165 ± 25

Table 3

Los Angeles Value Test Gradings B-25 Percent Flaky Particles (For Spalls Only)

Test Grading	Material Size	Mass of Unwashed Fraction. g		Desired Mass of Fraction. g		Test Mass of Test Sample (m_1)	Steel Balls	
	mm	Non-flaky Particles	Flaky Particles	Non-flaky Particles	Flaky Particles	g	Number	Total Mass g
B 25 percent flaky particles	19.0 13.2 13.2 9.50	1950 ± 50 1950 ± 50	675 ± 50 675 ± 50	1875 1875	625 625	5000 ± 10	11	4584 ± 25

(b) For crushing's from rock spalls, separate the flaky particles in each fraction using the slotted sieves or thickness gauge. Determine the percentage of flaky particles in each fraction (by mass). Keep flaky and non-flaky particles separated for later blending to comply with the B-25 percent flaky particles grading (see Table 3).

(c) Place each separate fraction in a suitable wire mesh basket or other appropriate container and sash material thoroughly by submerging and agitating the container and contents in running water for 10 min. or until the water remains clear, whichever is the longer period.

(d) Oven-dry each fraction at 105°C to 110°C for a period of 15 h to 16 h
Any further heating may create adverse effects by setting up stresses in the material.

(e) Allow the material to cool by standing in laboratory's ambient conditions for a minimum of 4 h.

(f) Obtain the required washed amounts of each fraction and combine these to comply with the selected test grading (see Table 1, 2 or 3).

5. Procedure

(a) Check, and record, the mass of the test portion (m_1) to the nearest gram.

(b) Select and make up appropriate steel ball charge and check mass of total charge (see Table 1, 2 or 3).

(c) Inspect Los Angeles abrasion testing machine for cleanliness and brush out if necessary.

(d) Place test portion and steel ball charge in the machine, place coverplate into position and tighten coverplate clamp-nuts evenly and securely.

(e) Set revolution counter to 500 and allow the machine to operate continuously for 500 revolutions.

(f) On completion, remove the coverplate, turn the drum until the aperture is at the bottom and then remove the test portion and charge of steel balls from the drum into the tray by hitting the drum with a rubber mallet and then cleaning the interior thoroughly with a soft brush. Special care must be taken to avoid loss of material.

(g) Remove the steel ball charge from the sample. Assemble the 300 mm diameter sieves in order 37.5, 26.5, 19.0, 9.50, 6.75, 4.75 and 1.70 mm and pan, and sieve the test portion by hand or in mechanical sieve shaker.

(h) Weigh the material passing the 1.70 sieve and record as m_p. Combine all material coarser than the 1.70 mm sieve and weigh and record as m_r. m_p and m_r are to be recorded to the nearest gram. The sum of m_p and m_r shall not differ from m_1 by more than 25 g. I the difference $m_p + m_r - m_1$ exceeds ± 25 g, repeat the test, using a fresh portion.

(i) Wash all material coarser than 1.70 mm in a 300 mm diameter 1.70 mm sieve under running water for 10 min. or until the water remains clear, whichever is the longer period.

(j) Transfer the washed material to a suitable container and oven dry at 105°C to 110°C for a minimum period of 16 h.

(k) Cool the material for a minimum period of 1 h, preferably 4 h, to 23 ± 2°C and resieve as in step (g).

(l) Combine all material coarser than the 1.70 sieve size and weigh to the nearest gram (m_w).

6. Calculations

Calculate the Los Angeles value from the following formula:

$$\text{Los Angeles value} = \frac{m_1 - m_w}{m_1} \times 100$$

Where

m_1 = total mass of the washed and dried material before abrasion, in grams.

m_w = mass of material retained on the 1.70 mm sieve after abrasion, washing, drying and resieving, in grams.

7. Reporting

Report the following:-

(a) The Los Angeles value to the nearest whole number

(b) The selected test grading

8. Techniques

(a) The strength or toughness of an aggregate depends partly on its moisture and temperature. To maintain a low variability between Los Angeles value results, pay special attention to the standardised washing, drying and cooling procedures.

(b) As the Los Angeles value depends on the shape of the stone, in cases of borderline results particle shape of each size portion must be determined in accordance with the procedure described in Test Method T213. In such cases, report the particle shape for the relevant size fractions.

(c) Check the Los Angeles abrasion testing machine periodically for wear and maintain to comply with the original specifications.

(d) Check the 1.70 mm sieve regularly, to ensure that it complies with AS1152. New sieves should also be checked.

(e) In view of the precautions taken to minimise the number of variable factors, it is considered that one test of any sample is adequate for routine testing. However, in the event of a dispute, or if requested by either party to a contract, duplicate tests may be carried out. Where duplicate tests are carried out, record the mean of the two test results as the Los Angeles value.

9. Repeatability

To a probability of 95 per cent, the result obtained for one test portion should not differ by more than 5 per cent of the mean Los Angeles value from the result obtained by the same operator using the same equipment for another test portion drawn form the same sample. That is, values of 20 should not differ by more than 1.