

Australian Standard™

AS 1141.20.1

Methods for sampling and testing aggregates**Method 20.1: Average least dimension—Direct measurement (nominal size 10 mm and greater)**

This Standard incorporates Amendment No. 1 (August 2019). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

1 SCOPE

This Standard sets out the counting method for determining the average least dimension of aggregate particles by the use of vernier callipers or dial gauge or a slotted gauge. The method is applicable to aggregate of nominal size 10 mm and greater for sprayed bituminous surfacing.

NOTE: The first use of the term ‘average least dimension’ is attributed to F.M. Hanson, MM, in the paper ‘Bituminous Surface Treatment of Rural Highways’ published by the New Zealand Society of Civil Engineers (Incorporated in 1935).

Present practice is outlined in the AUSTROADS publication (AP2/90), *Design of sprayed seals*, 1990.

2 REFERENCED DOCUMENTS

The following Standards are referred to in this Standard:

AS

1141 Methods for sampling and testing aggregates

1141.2 Method 2: Basic testing equipment

A1 | 1141.11.1 Method 11.1: Particle size distribution—Sieving method

A1 | [Text deleted]

3 APPARATUS

A1 | The following apparatus, conforming to the relevant provisions of AS 1141.2 and the requirements given below, is required:

- (a) Dial gauge or vernier callipers or slotted gauge (see Item (b) below).
- (b) A metal slotted gauge having slots of 2 mm, 4 mm, 6 mm, 8 mm, 10 mm, 12 mm, 14 mm, 16 mm, and 18 mm in height arranged consecutively in a suitable frame. The tolerance for all sized slots shall be ± 0.2 mm.
- (c) Quartering equipment or riffle box.
- (d) Containers that are metal dishes of sufficient size to contain the various portions of the test sample during testing.

4 PREPARATION TEST PORTION

The test portion shall be prepared in the following manner:

- A1 |
- (a) Sieve the sample as outlined in AS 1141.11.1.
 - (b) Discard all standard sieve size fractions that constitute less than 10 percent by mass of the sample.
 - (c) Recombine the remaining size fractions and reduce the size of the sample by quartering or riffing to obtain the test portion of at least 100 particles.

5 PROCEDURE

5.1 General

The following shall be observed:

- (a) Spread the particles on a flat surface and manipulate them in such a manner that they lie with their least dimension in a vertical plane.
- (b) Determine the dimensions in the vertical plane of each particle by one of the methods described in Clauses 5.2, 5.3 or 5.4.
- (c) Count the number of particles (*b*) in each class size (*a*).

5.2 Vernier callipers method

This procedure is as follow:

- (a) Set the vernier scale at an opening of 20 mm. Pass the particles through the opening in the orientation adopted in Clause 5.1(a) above.
- (b) Separate the particles into classes of 2 mm intervals in sizes, i.e. between 0 and 2 mm, 2 mm and 4 mm, and the like, by carrying out the procedure outlined above for vernier calliper openings of 18 mm, 16 mm, 14 mm, . . . 2 mm.

5.3 Dial gauge method

This procedure is as follows:

- (a) Zero dial gauge to a fixed plane surface.
- (b) Slide each particle under dial gauge in the orientation adopted in Clause 5.1(a) above. Record the maximum obtained for each particle.
- (c) Separate the particles into classes of 2 mm intervals in sizes, i.e. between 20 and 18 mm, 18 mm and 16 mm, . . . 2 mm and 0 mm.

5.4 Slotted gauge method

This procedure is as follows:

- (a) Slide the particles through the slotted gauges in the orientation adopted in Clause 5.1(a) above (see Figure 1).
- (b) Separate the particles into classes of 2 mm intervals in sizes, i.e. between 20 mm and 18 mm, 18 mm and 16 mm, . . . 2 mm and 0 mm.
- (c) Count and record the number of particles (*b*) for each class (see Table 1).

6 CALCULATION

The average of the class frequency distribution shall be calculated from Table 1.

TABLE 1
CALCULATION OF TOTAL DIMENSION OF PARTICLES

Class size (mm)	Class least dimension <i>a</i>	Number of particles	<i>a</i> × <i>b</i>
		<i>b</i>	
Less than 2	1	<i>n</i> ₁	1 <i>n</i> ₁
2 to 4	3	<i>n</i> ₃	3 <i>n</i> ₃
4 to 6	5	<i>n</i> ₅	5 <i>n</i> ₅
6 to 8	7	<i>n</i> ₇	7 <i>n</i> ₇
8 to 10	9	<i>n</i> ₉	9 <i>n</i> ₉
.	.	.	.
.	.	.	.
.	.	.	.
18 to 20	19	<i>n</i> ₁₉	19 <i>n</i> ₁₉

The average least dimension (ALD) shall be calculated from the following equation:

$$X = \frac{X_n}{n}$$

where

<i>X</i>	=	average least dimension, in millimetres
<i>X</i> _{<i>n</i>}	=	1 <i>n</i> ₁ + 3 <i>n</i> ₃ + 5 <i>n</i> ₅ + 19 <i>n</i> ₁₉ = <i>Γ</i> (<i>a</i> × <i>b</i>)
<i>n</i>	=	<i>n</i> ₁ + <i>n</i> ₃ + <i>n</i> ₅ + <i>n</i> ₁₉
<i>n</i> ₁ , ..., <i>n</i> ₁₉	=	number of particles in each dimension class

7 REPORT

The following shall be reported:

- (a) The average least dimension (ALD) in mm to the nearest 0.1 mm.
- (b) Reference to this Australian Standard, e.g. AS 1141.20.1.