

Australian Standard®

Methods for sampling and testing aggregates

Method 16: Angularity number

This Standard incorporates Amendment No. 1 (April 2016) and Amendment No. 2 (August 2019). The changes required by the Amendments 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 method for determining the angularity number of an aggregate.

The angularity number is a measure of relative angularity based on the percentage voids in an aggregate after compaction in the prescribed manner. The least angular (most rounded) aggregates have about 33% voids. The angularity number is defined as the amount by which the percentage of voids exceeds 33. The angularity number ranges from 0 to about 12.

Since considerably more compactive effort is used in the angularity test than in the determination of unit mass (see AS 1141.4), the results of the two tests are different. Also, weaker aggregates may be crushed during compaction, and the angularity number test does not apply to any aggregate that breaks down under test.

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2 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document.

AS

1141 Methods for sampling and testing aggregates

A2 | 1141.1 Part 1: Definitions

1141.2 Method 2: Basic testing equipment

1141.4 Method 4.1 Bulk density of aggregate

1141.6.1 Method 6.1: Particle density and water absorption of coarse aggregate—
Weighing-in-water method

A2 | [Text deleted]

3 TERMS AND DEFINITIONS

For the purposes of this document, the definitions given in AS 1141.1 apply.

4 APPARATUS

A2 | The following apparatus, conforming to the relevant provisions of AS 1141.2 and the requirements given below, is required:

- (a) *Balance* A balance of adequate capacity, with a limit of performance not exceeding ± 5 g.

(b) *Calibrated measure* A 5 L measure (nominal) with internal diameter 200 mm minimum and internal depth 170 mm minimum, calibrated using water at a temperature $23 \pm 2^\circ\text{C}$.

(c) *Oven* Thermostatically controlled oven, to operate at a temperature of 105°C to 110°C .

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(d) *Sieves* Perforated plate sieves in aperture sizes 37.5 mm, 19.0 mm, 13.2 mm, 9.50 mm, 6.70 mm and 4.75 mm.

(e) *Tamping tool* A 15 mm diameter, spherical ended steel rod.

5 TEST PORTION

The test portion shall consist of 10 kg of aggregate from the predominant sieve size, as determined by sieve analysis using 37.5 mm, 13.2 mm, 19.0 mm, 9.50 mm, 6.70 mm and 4.75 mm perforated-plate test sieves.

The test portion shall be obtained by sieving aggregate between the appropriate pair of 37.5 mm and 19.0 mm, 19.0 mm and 13.2 mm, 13.2 mm and 9.50 mm, 9.50 mm and 6.70 mm or 6.70 mm and 4.75 mm perforated-plate test sieves. The test portion shall be dried to constant mass and tested in a dry condition.

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NOTE: For a definition of constant mass, refer to AS 1141.1, Clause 3.4.

6 TEST PROCEDURE

Fill the 5L measure in the following manner:

- (a) Fill a scoop to overflowing with the aggregate, and transfer this to the measure by allowing it to slide off the scoop gently, from the least height possible, until the measure is about one-quarter full.
- (b) Tamp the aggregate in the measure with 125 blows of the tamping tool distributed evenly over the surface at a rate of about two blows per second. Apply each blow by holding the tamping tool vertically with its rounded end about 50 mm above the surface of the aggregate and releasing it so that it falls freely. Do not apply any force to the tamping tool.
- (c) Repeat this procedure with second, third and fourth layers of aggregate and ensure that the fourth layer contains just sufficient aggregate to fill the measure level with the top edge before tamping.
- (d) After the fourth layer has been tamped, fill the measure to overflowing and strike off the aggregate level with the top, using the tamping tool as a straightedge. Add individual pieces of aggregate and roll these into the surface by rolling the tamping tool across the upper edge of the measure. Continue this finishing process as long as the aggregate does not lift the tamping tool off the measure on either side. Avoid pushing in or otherwise forcing down the aggregate, and ensure that the tamping tool rolls in contact with the metal on both sides of the measure without any downward pressure being applied to it.

Determine the mass of the aggregate and the measure.

Make three separate determinations and calculate the mean mass of aggregate in the measure. If the result of any one determination differs from the mean by more than 25 g, make three additional determinations on the same material and calculate the mean of all six determinations.

7 CALCULATIONS

The angularity number shall be calculated from the following equation:

$$\text{Angularity number} = 67 - \left(\frac{100m_A}{m_W} \times \frac{1000}{D} \right)$$

where

m_A = mean of mass of aggregate in the measure, in kilograms

m_W = mass of water required to fill the measure, in kilograms

D = particle density in kilograms per cubic metre on a dry basis (1000 ρ_D)
determined by the method of AS 1141.6.1

8 REPORT

The following shall be reported:

- (a) The angularity number to the nearest whole number.
- (b) The aggregate or sieve size.
- (c) The number of this Standard, i.e., AS 1141.16.