

TEST METHOD WA 210.1 – 2013

PARTICLE SIZE DISTRIBUTION OF AGGREGATE

1 SCOPE

This method describes the procedure for the determination of the particle size distribution of aggregate.

2 SAFETY

This method does not attempt to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this method to establish appropriate occupational health and safety practices that meet statutory regulations.

3 REFERENCED DOCUMENTS

Main Roads Western Australia

WA 200.1: Sampling Procedures for Aggregate

WA 730.1: Bitumen Content and Particle Size Distribution of Asphalt and Stabilised Soil: Centrifuge Method

AS 1152: Specification For Test Sieves

4 APPARATUS

(a) **Sieves**, complying with AS 1152 as specified in Table 2.

(b) A thermostatically controlled **oven** with good air ventilation capable of maintaining a temperature within the range of 105°C to 110°C and / or a **microwave oven**.

(c) **Sieve brushes**.

(d) A **mortar** and **rubber pestle** (International Rubber Hardness Degrees 87 approximately).

(e) **Balance** of at least 16 kg capacity, readable to 0.1 g, with a Limit of Performance (F) of not more than 0.5 g.

5 PROCEDURE

(a) Obtain a test sample taken in accordance with Test Method WA 200.1 or a test portion in accordance with WA 730.1.

(b) Using sample division, obtain a test portion from the test sample. The minimum mass of the test portion shall be related to the nominal size of the material and shall be in accordance with Table 1, except for test portions obtained from WA 730.1.

TABLE 1

Nominal Size (mm)	<6	6 - 10	11 - 20	21 - 30	>30
Minimum Mass (kg)	0.5	1.0	2.0	5.0	15.0

(c) Record the initial mass of the test portion (m_0) to at least the nearest 0.1 g.

(d) Place the test portion in an oven at a temperature within the range of 105°C to 110°C and dry the test portion.

NOTES:

i. It is permissible to dry the test portion in a microwave oven.

ii. Test portions obtained from WA 730.1 have already been oven dried and may not require further drying.

(e) When the sample has been dried sufficiently, remove it from the oven

NOTE: If samples are allowed to cool prior to weighing, which will be required for certain balances, and there is a likelihood of moisture being taken up from the atmosphere, it may also be necessary to allow such samples to cool in a desiccator containing anhydrous silica gel.

(f) Determine and record the mass of the test portion, to at least the nearest 0.1 g.

(g) Repeat Procedure 5(d) to 5(f) at intervals of one hour until the difference between successive determinations of the mass of the test portion does not exceed 0.1% of the original mass (m_0) of the test portion.

Note: When using a microwave oven dry the test portion at intervals of 2 minutes.

(h) Record the mass of the dried test portion as (m_1), to at least the nearest 0.1 g.

(i) Nest the required sieves in order to decreasing aperture size from top to bottom, with a retainer under the bottom sieve.

(j) Estimate the mass of material that will be retained on each sieve. If the estimated mass of material

retained on any one sieve will exceed the permissible mass for that sieve shown in Table 2, divide the test portion into test increments so that the mass retained at the completion of agitating each sieve, will be equal to or less than the permissible mass shown in Table 2.

TABLE 2

Australian Standards Sieve Aperture (mm)	200 mm Diameter Sieve (g)	300 mm Diameter Sieve (g)
75.0	1000	2200
53.0	1000	2200
37.5	1000	2200
26.5	800	1800
19.0	600	1200
16.0	500	1000
13.2	400	900
9.50	250	500
6.70	200	400
4.75	200	400
2.36	150	300
1.18	100	200
0.600	75	-
0.425	60	-
0.300	50	-
0.150	40	-
0.075	25	-

(k) Place the test portion, or first test increment, in the top sieve.

(l) Agitate the sieves. When sieving by hand use a lateral and vertical motion of the sieve accompanied by a jarring action to keep the particles moving continuously over the surface of the sieve. Mechanical sieve shakers may be used as an alternative.

(m) Continue agitation until the mass passing each sieve in twenty to thirty seconds of continuous hand sieving is less than one percent of the mass of material retained on that sieve.

NOTES:

i. Material should not be forced through sieves by hand pressure, but on sieves of 19.0 mm aperture and greater, hand placing of particles shall be permitted if this will facilitate passage of particles through the sieve.

ii. Break up any aggregations of particles in such a way as to avoid crushing any individual particles. Take care that no discrete particles are crushed in this operation but ensure that all aggregations of particles are broken down so that only discrete uncrushed particles are retained on each sieve. If necessary, brush fines off the particles using a stiff nylon bristled brush.

(o) If the test portion was divided into test increments, recombine the particles retained on each sieve and consider these as single sieve fractions.

(p) Determine the mass, to at least the nearest 0.1 g, of material retained on each sieve including any material cleaned from the mesh or perforated plate.

NOTE: Care shall be taken when cleaning material from the mesh or perforated plate not to damage the sieve apertures. A stiff nylon bristled brush should be used to clean sieves of 2.36 mm aperture and greater, a stencil brush should be used to clean sieves of apertures 1.18 mm to 0.300 mm inclusive and a camel hair brush used to clean sieves of apertures 0.150 mm and 0.075 mm.

(q) Determine the mass, to at least the nearest 0.1 g, of material collected in the retainer. Record as the mass passing the smallest aperture sieve in the nest of sieves.

6 CALCULATIONS

(a) Calculate, by addition, the mass of material passing each of the sieves used for the particle size distribution commencing with the mass of material passing the smallest aperture sieve.

Record the total mass of the test portion after sieving as m_2 , to at least the nearest 0.1 g.

If the mass (m_2) of the test portion after sieving varies by more than 1% from the mass of the dried test portion (m_1), then the test portion shall be re-sieved.

(b) Calculate the percentage mass of material passing each sieve used in the particle size distribution by dividing the mass passing each sieve by m_2 and expressing the result as a percentage.

7 REPORTING

Report the percentage mass passing each sieve of aperture 2.36 mm or larger to the nearest 1 percent and the percentage mass passing each sieve of aperture 1.18 mm or smaller to the nearest 0.1 percent.

8 ISSUING AUTHORITY

Document Owner Manager Materials Engineering	Delegated Custodian Pavements Manager
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9 REVISION STATUS RECORD

Page No.	Section	Revision Description / Reference
1	REFERENCED DOCUMENTS	Inclusion of AS 1152
2	REPORTING	Reporting Requirements