

Australian Standard®

Methods for sampling and testing aggregates

Method 6.2: Particle density and water absorption of coarse aggregate— Pycnometer method

1 SCOPE This Standard sets out the method for determining the particle density, apparent particle density and water absorption of aggregates substantially retained on a 4.75 mm sieve, by weighing in water in a pycnometer.

NOTE: An aggregate containing more than 10 percent of material passing a 4.75 mm test sieve is regarded as a mixed aggregate.

A mixed aggregate is separated into two fractions consisting of material retained on and material passing a 4.75 mm sieve. The density of the fine fractions is determined separately by the method AS 1141.5. The density of the mixed aggregate is calculated as a weighted average as illustrated in Clause 7(e).

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

- 1141 Methods for sampling and testing aggregates
- 1141.1 Method 1: Definitions
- 1141.2 Method 2: Basic testing equipment
- 1141.5 Method 5: Particle density and water absorption of fine aggregate
- 1152 Specification for test sieves

3 DEFINITIONS For the purpose of this Standard the definitions in AS 1141.1 and those below apply.

3.1 Apparent particle density—the dry mass per unit volume of particles, the volume including only impermeable voids inherent in the particles.

3.2 Particle density on a dry basis—the dry mass per unit volume of particles, the volume including both the permeable and impermeable voids inherent in the particles.

Impermeable voids are those inaccessible to water by 24 h soaking. Permeable voids are those accessible to water by 24 h soaking.

3.3 Particle density on a saturated surface-dry basis—the saturated surface-dry mass per unit volume of particles, the volume including both the permeable and impermeable voids inherent in the particles.

3.4 Water absorption—the ratio, expressed as a percentage, of the mass of water held in the permeable voids of the particles brought to the saturated surface-dry condition following soaking under water for 24 h, to the oven dry mass of the material.

4 APPARATUS The following apparatus, complying with the relevant provisions of AS 1141.2, is required:

- (a) *Pycnometer*—a glass or stainless steel vessel equipped with a stopper or ground flat at the top and with a top opening sufficiently wide to place the largest particles inside. The volume of the pycnometer should be not less than 2 L for aggregates with a nominal size less than or equal to 20 mm and 5 L for larger nominal size aggregates. Volumetric flasks are suitable alternatives.
- (b) *Pycnometer lid*—slightly larger than the top of the pycnometer and ground flat on at least one side (a stopper may be used with a suitable pycnometer).
- (c) *Thermometer*—covering the range 0 to 40°C graduated 1°C or less, with an uncertainty not exceeding 0.5°C.
- (d) *Balance*—of sufficient capacity, having a limit of performance not exceeding ± 5 g.
- (e) *Oven*—thermostatically controlled to operate at a temperature of 105 to 110°C.
- (f) *Container*—for storing water at room temperature.
- (g) *Potable distilled or de-mineralized water*—as appropriate (see Note).
NOTE: Water used for the test should not contain minerals or other contaminants which react with the aggregate or substantially change the density of water.
- (h) *Towels and dry cloths*—for drying the stone.
- (i) *Dishes*—of suitable size.

5 PREPARATION OF TEST PORTION Test portions shall be prepared as follows:

- (a) Obtain a sample of sufficient mass to permit the preparation of a test portion retained on the 4.75 mm sieve of least 2 kg for sizes up to and including 20 mm aggregate and at least 5 kg for larger sizes.
- (b) Sieve the sample over a 4.75 mm sieve. Reject the undersize material if it amounts to less than 10 percent of the total. If the amount of undersize material amounts to more than 10 percent, test it separately by the method of AS 1141.5. Wash the sample thoroughly to remove dust or other coatings from the surface of the particles.
- (c) Quarter or divide the washed material to obtain a test portion of at least 2 kg for sizes up to and including 20 mm aggregate, or 5 kg for larger sizes.

6 PROCEDURE Treat the test portion as follows:

- (a) Place the test portion in a container and cover the aggregate so that at least 20 mm of water is above the top of the aggregate. Allow the test portion to soak in the water at room temperature for a period of at least 24 h. Stir the material occasionally to dislodge air bubbles. The material shall remain completely immersed during the soaking period.

NOTE: For materials with water absorption greater than 5 percent the time of soaking should be the same time for each test portion and should be 24 to 26 hours.

- (b) If the particle density or water absorption, or both, is required, surface dry the material. Large stones can be dried individually while the finer material may be rolled on a dry cloth. Spread the material one stone deep over a dry cloth and allow it to surface dry, turning the stone at least once during this period. A gentle current of air may be used to accelerate the drying. Continue the procedure of rolling and wiping, taking care to minimize evaporation, until all visible films of water have been removed but the surfaces of particles still appear to be damp.

Determine the mass of the saturated surface-dry material and record (m_2).