

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1289.3.5.2—2002

Methods of testing soils for engineering purposes

Method 3.5.2: Soil classification tests—Determination of the soil particle density of
combined soil fractions—Vacuum pycnometer method

RECONFIRMATION NOTICE

Technical Committee CE-009 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 13 June 2013.

The following are represented on Technical Committee CE-009:

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NOTES

Australian Standard™

AS 1289.3.5.2

Methods of testing soils for engineering purposes

Method 3.5.2: Soil classification tests— Determination of the soil particle density of combined soil fractions—Vacuum pycnometer method

1 SCOPE

This Standard sets out a method for determining the soil particle density of combined coarse, medium and fine or medium and fine fractions of a soil, using a vacuum pycnometer.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

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|------------|--|
| 1289 | Methods of testing soils for engineering purposes |
| 1289.0 | Part 0: General requirements and list of methods |
| 1289.1.1 | Method 1.1: Sampling and preparation of soils—Preparation of disturbed soil samples for testing |
| 1289.2.1.1 | Method 2.1.1: Soil moisture content tests—Determination of the moisture content of a soil—Oven drying method (standard method) |

3 APPARATUS

The following apparatus is required:

- (a) Pycnometer, a vacuum-type glass flask or stainless steel vessel equipped with a stopper or ground flat at the top with the top opening sufficiently wide to place the largest particles inside. The pycnometer volume required for material of a particular maximum particle size is given in Table 1.
- (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) Vacuum pump, capable of producing a vacuum of about 700 mm of mercury, including connections and water vapour traps, etc.
NOTE: A vacuum of about 700 mm of mercury necessitates care being taken, particularly in the initial stages, if material is not to be lost.
- (d) Safety surround, to retain flying glass if an implosion should occur owing to the reduced pressure.
- (e) Thermometer or other suitable temperature-measuring device covering a range of 0°C to 50°C, graduated to 1°C or less, with an uncertainty not greater than $\pm 0.5^\circ\text{C}$.
- (f) Balances with limits of performance as shown in Table 1.
- (g) Drying oven as specified in AS 1289.0.
- (h) Container for storing water at room temperature.

- (i) Potable water.

NOTE: The type of material being tested has an influence on the required purity of the water. The test result for a material of relatively low density, e.g., an organic clay, will be much more affected by water impurities than the test result for dense stone; in such cases, distilled or filtered water should be used. Sufficient water has to be stored at room temperature to allow for filling the pycnometer.

TABLE 1
SAMPLE MASS, BALANCE REQUIREMENTS, AND PYCNOMETER VOLUME,
FOR SOIL FRACTIONS

Soil fractions	Minimum mass of subsample g	Limit of performance of balance not greater than g	Precision of mass determinations g	Minimum pycnometer volume mL
Coarse + medium + fine	2 500	±5	1	5 000
Medium + fine	1 000	±0.5	0.1	1 000

4 PROCEDURE

4.1 Sample preparation

The procedure shall be as follows:

- Prepare a representative sample of the material, in accordance with AS 1289.1.1, with sufficient quantity of material for both the soil particle density test and the moisture content test (see Table 1).
- Subdivide the sample into three representative subsamples, one for moisture content and two for the soil particle density test.
- Determine the moisture content (w), to the nearest 0.1%, of the subsample prepared for that purpose, in accordance with AS 1289.2.1.1, ensuring that the moisture content subsample is in the same moisture condition as the other subsamples, when weighed in the pycnometer prior to inundation with water and evacuation.

4.2 Soil particle density

For the two subsamples prepared for the soil particle density test, the procedure shall be as follows:

- Select the appropriate size of pycnometer in accordance with the requirements of Table 1.
- Weigh a clean, dry pycnometer plus lid or stopper, and record the mass (m_1).
- Transfer the moist subsample to the pycnometer, replace the lid or stopper, and weigh and record the mass of pycnometer plus lid or stopper, plus soil (m_2).
- Add water (see Note to Clause 3(i)) until the pycnometer is about half full, ensuring all material is covered. Place the pycnometer in the safety surround. Boil the contents under a vacuum of about 700 mm of mercury for at least 2 h at room temperature.
- Release the vacuum slowly, remove the pycnometer from the safety shield and without causing undue disturbance add water to within 5 mm of the top.
- Top up the pycnometer with water and slide the lid on or insert the stopper, making sure that no air bubbles are trapped. Dry the outside of the pycnometer. Weigh the pycnometer plus lid or stopper, plus soil, plus water and record the mass (m_3).