

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1289.5.3.5—1997

Methods of testing soils for engineering purposes

Method 5.3.5: Soil compaction and density tests—Determination of the field dry
density of a soil—Water replacement 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®

Methods of testing soils for engineering purposes

Method 5.3.5: Soil compaction and density tests — Determination of the field dry density of a soil — Water replacement method

1 SCOPE This Standard sets out the method for determining the field dry density of a natural or compacted coarse-grained soil by the water replacement method, using a circular density ring on the surface and a plastic sheet to retain the water (see Notes 1 and 2). This test is particularly appropriate for soils containing appreciable proportions of cobbles and boulders as defined in AS 1289.0, e.g. rock fill.

The gross mass per unit volume (wet density) may be computed and the dry mass per unit volume (dry density) obtained by correcting for the moisture content.

The field dry density is determined either for the total material or for material finer than 19.0 mm, unless otherwise specified.

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

AS	
1152	Specification for test sieves
1289	Methods of testing soil for engineering purposes
1289.0	Method 0 General requirements and list of methods
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)
1289.2.1.2	Method 2.1.2 Soil moisture content tests — Determination of the moisture content of a soil — Sand bath method (subsidiary method)
1289.2.1.4	Method 2.1.4 Soil moisture content tests — Determination of the moisture content of a soil — Microwave-oven drying method (subsidiary method)
1289.2.1.5	Method 2.1.5 Soil moisture content tests — Determination of the moisture content of a soil — Infrared lights method (subsidiary method)
1289.2.1.6	Method 2.1.6 Soil moisture content tests — Determination of the moisture content of a soil — Hotplate drying method (subsidiary method)
1289.B3.1	Method B3.1 Establishment of correlation between a subsidiary method of moisture content determination and the standard method (AS 1289.B1.1)
1289.3.5.1	Method 3.5.1 Soil classification tests — Determination of the soil particle density of a soil — Standard method
1289.5.1.1	Method 5.1.1 Soil compaction and density tests — Determination of the dry density/moisture content relation of a soil using standard compactive effort
1289.5.2.1	Method 5.2.1 Soil compaction and density tests — Determination of the dry density/moisture content relation of a soil using modified compactive effort

3 APPARATUS The following apparatus shall be used:

- (a) Density ring (see Note 3), and steel spikes, if required.
- (b) Straightedge.
- (c) Plastic sheet—
0.1 mm thick, 2 m to 4 m square (for rings to 1.5 m diameter) (see Note 4); and
0.2 mm thick, 6 m to 8 m square (for rings over 1.5 m and up to 2.5 m diameter).
- (d) Pointer gauge assembly (horizontal bar fitted with an adjustable vertical pointer and locknut) and supports.
- (e) Quick-setting plaster, or local rock fines.
- (f) Apparatus for delivering, measuring and removing the volume of water required (see Note 5).
- (g) A balance of at least adequate capacity with a limit of performance not exceeding ± 5 g.
- (h) Platform scale of at least 100 kg capacity and readable to 0.1 percent of full scale (see Note 6).
- (i) Containers to hold the excavated soil. Suitable metal skips with approximate dimensions 1.2 m $\times$ 0.6 m $\times$ 0.5 m can be used.
- (j) Suitable tools for excavating and cleaning holes in coarse soils and rocky materials, e.g. pick, shovel, crowbar, broom, scoop. A mechanical backhoe may be used for large holes 2 m diameter and over.
- (k) Sieves, as described in AS 1152.
- (l) Siphon can and measuring cylinders, if required.
- (m) Spirit level of suitable length to use with ring.

4 PROCEDURE The procedure shall be as follows:

- (a) Select a test site which has an even surface and is substantially level. Place the ring on the test site in a level position and secure it to the surface to prevent any movement during the performance of the test.
- (b) Fill the voids between the underside of the ring and the surface with quick-setting plaster or local rock fines. If plaster is used, ensure that any surplus is removed from the inside of the ring. If local rock fines are used, pack them beneath the ring by hand. Remove all loose material and sharp projections from the test surface.
- (c) Set up the pointer gauge assembly so that the pointer can be removed and returned to a fixed position below the top of the ring (see Note 7). Remove the pointer gauge bar to a safe position.
- (d) After checking for punctures, spread the plastic sheet (see Note 4) over the ring and test surface. Replace the pointer gauge bar.
- (e) Fill the space contained by the plastic sheet with water. Sufficient water should be used to ensure that the plastic sheet is fully in contact with the ring and all surface hollows and projections (see Note 8).

Adjust the pointer so that it just touches the water surface and check for leaks (see Note 9).

The measured volume of the water used is the initial reading (V_1) for the test, in litres.