

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1289.5.8.7—1998

Methods of testing soils for engineering purposes

**Method 5.8.7: Soil compaction and density tests—Nuclear surface moisture-density
gauges—Water content of a standard moisture block using hydrogen content of
components**

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 15 February 2013.

The following are represented on Technical Committee CE-009:

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NOTES

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Methods of testing soils for engineering purposes

Method 5.8.7: Soil compaction and density tests—Nuclear surface moisture-density gauges—Water content of a standard moisture block using hydrogen content of components

1 SCOPE This Standard sets out the method for the construction of and assignment of water content using the hydrogen content of the components, to a standard moisture block for use in the calibration of nuclear surface moisture-density gauges in accordance with AS 1289.5.8.4. The block shall consist of an intimate mix of sand and polystyrene at a specific proportion. Guidance on the number of blocks required for a set of standard moisture blocks and the proportioning of the sand and polystyrene mixes is given in AS 1289.5.8.4.

NOTE: A standard moisture block constructed in accordance with this Standard may be used as—

- (a) a standard moisture block for use in the calibration of nuclear surface moisture-density gauges in accordance with AS 1289.5.8.4, if the water content has been assigned in accordance with this Standard;
- (b) a primary standard moisture block for use in AS 1289.5.8.9 if the water content has been assigned in accordance with this Standard; or as
- (c) a standard moisture block for which the moisture content may be assigned by comparison against primary standard moisture blocks in accordance with AS 1289.5.8.9.

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

AS

- | | |
|------------|--|
| 1289 | Methods of testing soils for engineering purposes |
| 1289.5.8.4 | Method 5.8.4: Soil compaction and density tests—Nuclear surface moisture-density gauges—Calibration using standard blocks |
| 1289.5.8.9 | Method 5.8.9: Soil compaction and density tests—Nuclear surface moisture-density gauges—Water content of a standard moisture block using comparison against primary blocks |

3 APPARATUS The following apparatus shall be used:

- (a) Clean quartz sand, with 100% passing a 1.18 mm sieve and not more than 5% passing a 0.425 mm sieve. The hygroscopic moisture content of the sand shall not exceed 0.5%, with the total hydrogen content of the sand and its hygroscopic moisture content being determined to an accuracy of 0.2% of the reported values.

The sand may require washing or chemical treatment to remove any deleterious organic material. The sand shall be dried to constant mass before sampling for analysis and construction of the block.

- (b) Unexpanded polystyrene beads with hydrogen content determined to an accuracy of 0.2%.

NOTE: If the unexpanded polystyrene beads contain a blowing agent such as pentane, this should be removed by drying, at a temperature of 50°C, to constant mass.

- (c) Rectangular aluminium mould, with minimum internal dimensions of 550 mm by 550 mm by 230 mm deep. The volume of the mould shall be determined in accordance with Clauses 4.1 and 5.1. The uncertainty of the volume shall not be higher than 0.5%. The inside edge of the top of the mould shall not deviate by more than 0.5 mm from a horizontal plane of best fit. The construction of the mould should be such that it will not distort during the placement of the sand/polystyrene mix and subsequent calibrations of nuclear surface moisture-density gauges.
- (d) Rectangular collar 25 mm to 50 mm high of the same inside dimensions as the moulds.
- (e) Cell assembly, which will temporarily divide the mould into a number of equal size cells.

The cell assembly (see Figure 1) for a 550 mm × 550 mm mould consists of eight walls to divide the mould into 25 cells of nominally equal volume. The length and width of the cells should be 100 mm ±10 mm. If a larger mould is employed a greater number of cells should be created, i.e. 36 cells for a 600 mm × 600 mm mould. The cell walls shall be of stainless steel, no more than 2 mm thick, 50 mm higher than the mould depth and being the same length as the internal length or width of the mould as appropriate to its location within the mould. The walls shall be assembled into a rigid structure, by spot welding, slotting or other means, provided the volume of each cell remains within 5% of the mean volume. The completed cell assembly shall be a sliding fit into the mould, with minimum gap between the mould wall and the assembly to prevent loss of sand/polystyrene mix from the cells.

- (f) Balance of 5 kg capacity, with a limit of performance not exceeding 0.05 g.
- (g) One metre straightedge.
- (h) Vernier callipers or other length and depth measuring devices, with an uncertainty of 0.1 mm.
- (i) Hardwood block, 100 mm longer than the longest internal dimension of the mould and a sliding fit into the cells. The end faces of the block are to be at right angles to the longitudinal axis of the block.
- (j) Funnel with a spout of minimum length 200 mm and outlet of approximately 10 mm diameter.
- (k) Aluminium plate of 1 mm thickness, to slightly overlap the inside edges of the mould.

4 PROCEDURE

4.1 Measurement of mould dimensions Proceed as follows:

- (a) Measure the length of the mould at five equally spaced locations between one pair of opposite sidewalls. At each location measure and record the internal length of the mould at three equally spaced vertical positions (base, intermediate and top).
- (b) Measure the width of the mould at five equally spaced locations between the other pair of opposite sidewalls. At each location measure and record the internal width of the mould at three equally spaced vertical positions (base, intermediate and top).

- (c) Measure the height of the mould at five equally spaced positions along each of the two longer sidewalls and at the midpoint of the line joining each pair of opposite sidewall points. At the three non-sidewall locations, measure the height between the bottom surface and the underside of a straightedge across the top of the mould.

4.2 Determination of the hydrogen content of the sand and of the polystyrene

Proceed as follows:

- (a) Obtain a representative sample of the sand and of the polystyrene.
- (b) Determine the hydrogen content of the sand (H_{s_i}) and of the polystyrene (H_{p_i}), in percentage, using at least two independent laboratories.

NOTE: Determination can be made by the high temperature combustion method or by a procedure of equivalent accuracy.

- (c) The range for both the hydrogen content determinations shall not exceed 2.5% of the mean value.

4.3 Assembly of the standard moisture block Proceed as follows:

- (a) Place the mould in the position for calibration of nuclear gauges, place the cell assembly into the mould and position the mould collar.
- (b) Select the proportions of sand and polystyrene, appropriate to the target assigned moisture content.
- (c) Estimate the masses of sand and polystyrene necessary to fill one cell from the selected proportion, the material densities, the number of cells and the mould volume.
- (d) Weigh and mix thoroughly together the sand and polystyrene required for 50 mm thick layers in each cell. Allocate each mix batch to a particular cell. The thickness of the layers may vary slightly, according to the depth of the mould. Determine the total mass (m_i) of material mixed for each cell.
- (e) Use the funnel to place 50 mm layers of material into each cell, moving the funnel spout in a circular pattern to evenly deposit the material. For each cell, after completion of a layer, level the surface and apply a force, using the end of the hardwood block, to compact the material without distorting the cell walls.
- (f) When the mould is full, withdraw the cell assembly, taking care to minimize disturbance of the material, and remove the collar taking care not to lose any of the material.

NOTE: At high proportions of polystyrene, minor segregation of the sand and polystyrene may occur at the surface if the cell assembly is withdrawn in one operation. This segregation can be minimized by raising the cell assembly after compacting two layers, until the depth of embedment in the compacted material is 20 to 25 mm and then placing the next two layers.

- (g) Apply a vertical force using the long side of the hardwood block, to the surface of the material. Apply the same force evenly over the whole of the surface.
- (h) Level the surface, using the straightedge, to the plane defined by the top edges of the mould. Determine the mass (A) of any additional material required.
- (i) Determine the mass (R) of all surplus material from Steps (d) and (h).
- (j) Cover the mould with the aluminium plate.
- (k) Care shall be taken at all times to avoid shock loading or vibration which may cause segregation of the material of the assembled block.