

## Australian Standard®

**Methods of testing soils for engineering purposes****Method 5.8.4: Soil compaction and density tests—Nuclear surface moisture-density gauges—Calibration using standard blocks**

*This Standard incorporates Amendment No. 1 (October 2012). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.*

**1 SCOPE**

This Standard sets out the method for the following:

- (a) The calibration of the density system of a nuclear surface moisture-density gauge using standard density blocks. The calibration equation, so derived, defines the relationship between the density count ratio and field density for direct transmission measurement (see Notes 1 and 2).

**NOTES:**

- 1 A nuclear surface moisture-density gauge calibrated in accordance with this method may also be used for the determination of the field density of asphalt in accordance with AS 2891.14.1.1.
  - 2 When the density and moisture systems operate independently, a gauge may be used to measure only one variable (either density or moisture).
- (b) The partial calibration of the moisture system of a nuclear surface moisture-density gauge using standard moisture blocks. The calibration equation, so derived, defines the slope of the moisture calibration equation. The intercept of the moisture calibration equation for each particular material is determined from actual measurements of field moisture content, as detailed in AS 1289.5.8.1.

**2 REFERENCED DOCUMENTS**

The following documents are referred to in this Standard:

**AS**

- 1289 Methods of testing soils for engineering purposes
- 1289.5.8.1 Method 5.8.1: Soil compaction and density tests—Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge—Direct transmission mode
- 1289.5.8.5 Method 5.8.5: Soil compaction and density tests—Nuclear surface moisture-density gauges—Density of a Type A or Type C Standard density block
- 1289.5.8.7 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

## AS

- 1289.5.8.8 Method 5.8.8: Soil compaction and density tests—Nuclear surface moisture-density gauges—Water content of a Standard moisture block using proportion of water
- 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

## AS/NZS

- 2891 Methods of sampling and testing asphalt
- 2891.14.1.1 Method 14.1.1: Field density tests—Determination of field density of compacted asphalt using a nuclear moisture-density gauge—Direct transmission mode

## ISO/IEC

- Guide 98–3 Uncertainty of measurement—Guide to the expression of uncertainty measurement

**3 SAFETY PRECAUTIONS**

The equipment used in this method utilizes radioactive materials that may be hazardous to health unless proper precautions are taken. Therefore, it is essential that operators receive instruction on potential hazards and precautions, together with routine safety procedures such as the use of personal radiation monitors, source leak testing and use of radiation survey meters.

**4 APPARATUS**

The following apparatus is required (additional items may be required for some types of gauges):

- (a) Nuclear surface moisture-density gauge, manufacturer's handbook for the gauge and the manufacturer's reference block.
- (b) Standard density blocks, Type A or Type C, complying with the following:
  - (i) The density range spanned by the blocks shall cover the range of densities that are expected to be encountered in the field. The density of the blocks shall be evenly spaced throughout the range.
  - (ii) Each block shall have minimum dimensions of 550 mm length  $\times$  450 mm width and a minimum depth of 50 mm greater than the maximum depth at which the gauge is to be calibrated. Blocks of not less than 300 mm in width may be used, provided two or more such blocks are strapped together with 50 mm thick aluminium plates on each end.
  - (iii) The top surface of each block shall be finished with an out-of-flatness not exceeding 0.5 mm. When determining the density of a block in accordance with AS 1289.5.8.5, using direct measurement of volume, each of the other surfaces of the block shall be finished with an out-of-flatness not exceeding 1 mm.
  - (iv) A direct transmission access hole of diameter not exceeding 20 mm shall be drilled in the block, normal to the top surface, at least 100 mm from the end and on the longitudinal axis of the block. The centre of the access hole shall be at least 150 mm from the sides of the block. The depth of the access hole shall be at least 50 mm greater than the calibration depth. If desired, two access holes, one near each end, may be drilled.

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