

Australian/New Zealand Standard™

AS/NZS 2891.14.4:2013

Methods of sampling and testing asphalt

Method 14.4: Field density tests—Calibration of nuclear surface moisture-density gauge—Backscatter mode

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CE-006, Asphalt and Sprayed Surfacing, to supersede AS/NZS 2891.14.4:1999.

METHOD

1 SCOPE

This Standard sets out the method for the calibration of the density system of a nuclear surface moisture-density gauge, using standard blocks, when operated in the backscatter mode. The calibration equation, so derived, defines the relationship between the density count ratio and field density. An adjustment to the calibration equation is determined for each material tested from measurements of field density tested in accordance with AS/NZS 2891.14.1.2.

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 |
| 1289.5.8.4 | Method 5.8.4: Soil compaction and density tests—Nuclear surface moisture-density gauges—Calibration using standard blocks |

AS/NZS

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| 2891 | Methods of sampling and testing asphalt |
| 2891.14.1.2 | Method 14.1.2: Field density tests—Determination of field density of compacted asphalt using a nuclear surface moisture-density gauge—Backscatter mode |

3 SAFETY PRECAUTIONS

The equipment used in this procedure utilizes radioactive materials which 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 check procedures such as the use of personal radiation monitors, source leak testing and the use of radiation survey meters. Statutory regulations cover the use and transport of radioactive substances and users need to ensure that these regulations are complied with, for the State or Territory in which the instrument is to be used.

4 APPARATUS

The following items of apparatus are required for the correct performance of the test (additional apparatus may be required for the correct usage of a particular model of gauge).

4.1 Nuclear surface moisture-density gauge

Complete with the manufacturer's handbook for the gauge, and the manufacturer's reference block.

4.2 A set of standard density blocks, Type A or C

As defined in AS 1289.5.8.4.

4.3 Radiation monitoring apparatus and personal radiation monitors

As required by the regulatory authority.

5 PROCEDURE

5.1 Preparation for calibration

The calibration blocks shall be stored under cover to protect them from the effects of the weather.

Before a calibration is commenced, it shall be ensured that the blocks to be used are sufficiently clear of other nuclear gauges or other sources of radiation to ensure there is no detectable effect on the counts displayed by the gauge. In buildings that are restricted in the available area, it may be necessary to provide shielding to achieve this requirement.

The location for the standard count determinations and the gauge function checks shall be at least 1 m from any vertical projection or any known neutron absorber or moderator.

There shall be a minimum clearance of 1 m from any vertical projection which is above the level of the top of the blocks.

It shall be ensured that the gauge is in good working order and that the base of the gauge, the manufacturer's reference block and the standard blocks are clean.

5.2 Gauge function check

Gauge function checks shall be performed in accordance with the procedure specified for the gauge and the results shall be recorded. If the results of these checks fail to comply with the specified requirements, the function checks shall be repeated. If the results of the repeat function checks fail to comply with the specified requirements, the gauge shall be withdrawn from service until the reason for the fault is determined and the fault rectified.

5.3 Standard count check

The check shall be performed in accordance with AS/NZS 2891.14.1.2.

5.4 Determination of density calibration data

The procedure shall be as follows:

- (a) Obtain and record an initial standard density count for the gauge on the manufacturer's reference block in accordance with the procedure specified by the manufacturer. Use a counting period of at least 4 min. The initial standard count may be the fifth standard count of the standard counts check, provided the checks and calibrations are carried out at the same location.
- (b) Place the gauge on a standard density block, so that it is clear of any access holes and the edges of the block. Lower the probe to the required backscatter position.
- (c) Without shifting the gauge, obtain and record five 4 minute counts in accordance with the manufacturer's instructions.
- (d) Repeat Steps (b) to (c) for the remaining standard density blocks.
- (e) Repeat Steps (b) to (d) for each required backscatter position of the probe.
- (f) Obtain and record a final standard count for the gauge in accordance with and at the same location as Step (a). If this value falls outside the limits determined in accordance with AS 1289.5.8.4, the values determined from Steps (a) to (e) shall be rejected, and the calibration shall not proceed until the reason for the standard count being outside the limits is determined and the fault rectified.

Initial and final standard counts together with the complete calibration data shall be determined in one day.

6 CALCULATIONS

6.1 Density data

For each backscatter position of the probe, the following shall be calculated:

- (a) The mean of the initial and final standard density counts obtained from Clause 5.4, Steps (a) and (f), respectively.
- (b) The mean of the density counts on each standard density block obtained from Clause 5.4, Steps (c) and (d).
- (c) The density count ratio (*DCR*) on each standard density block by dividing the mean density count obtained from Step 6.1(b) by the mean standard density count obtained from Step 6.1(a).

6.2 Density calibration constants

For each backscatter position of the probe the density calibration constants shall be calculated in accordance with AS 1289.5.8.4 for the appropriate type of standard density blocks.

6.3 Calculation of uncertainty of the calibration

For each backscatter position of the probe the uncertainty of the density shall be calculated in accordance with AS 1289.5.8.4.

7 GAUGE MICROPROCESSOR VALIDATION

For gauges in which a microprocessor is used, the calibration constants shall be entered and stored in the microprocessor and shall be validated on materials at or close to zero water content.