

Australian/New Zealand Standard™

AS/NZS 2891.14.1.1:2013

Methods of sampling and testing asphalt

Method 14.1.1: Field density tests— Determination of field density of compacted asphalt using a nuclear surface moisture-density gauge—Direct transmission 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 2891.14.1.1:1996.

METHOD

1 SCOPE

This Standard sets out the method for determining the field density of asphalt using a nuclear surface moisture-density gauge in the direct transmission mode of operation. The method is applicable to asphalt layers equal to or greater than 75 mm in thickness, and to asphalts having a nominal maximum size not greater than 40 mm.

Because of the variety of gauges available, this method does not detail the operation of the gauge, but refers the operator to the manufacturer's handbook.

A nuclear gauge gives an indirect measure of field density and hence requires calibration in accordance with AS 1289.5.8.4. Regular checks on the operation and the calibration of the gauge are also required.

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

3 SAFETY PRECAUTIONS

The equipment used in this method 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 essential for the correct performance of the test (additional items may be required for the correct usage of a particular model of gauge).

4.1 Nuclear surface moisture-density gauge

With a calibration density uncertainty of less than 0.07 t/m^3 , logbook, manufacturer's handbook for the gauge, and the manufacturer's reference block for standard counts which was used during the calibration of the gauge.

4.2 Scraper plate

With an upright tube to provide a guide to drill, or drive a hole in the asphalt in a vertical plane.

4.3 Broom or brush

Suitable for cleaning road surface.

4.4 Drill rod and hammer

Alternatively, an electrical or pneumatic drill may be used.

NOTE: In order to avoid distorting the surface of the asphalt, the shaft of the drill rod should be tapered 1 in 100 over its length.

4.5 Secondary block of naturally occurring stone or concrete

Minimum size 500 mm long by 300 mm wide by, at least, 50 mm greater than the maximum depth at which the gauge density system consistency checks will be carried out. The density of this block does not necessarily need to be known.

NOTE: Concrete secondary blocks may be used provided they have been allowed to dry to a stable state following manufacture, and are kept in a stable moisture condition.

4.6 Radiation monitoring apparatus and personal radiation monitors

As required by the appropriate regulatory authority.

4.7 Fine material [optional, see Step 5(e)]

100% passing 0.600 mm sieve. This material may be natural sand or fines from the source rock of the aggregate in the asphalt.

4.8 Gauge calibration and operational checks

Nuclear surface moisture-density gauges shall be calibrated at each probe position of interest, in accordance with AS 1289.5.8.4, and shall be recalibrated at least once every two years or after any major repair or component replacement. Regular checks on the operation and calibration of the gauges shall be made as follows:

- (a) Standard count checks, as detailed in Paragraph A1 of Appendix A, shall be made on each day of use.
- (b) Gauge function checks, as detailed in Paragraph A2 of Appendix A, shall be made at least once per month.
- (c) Density system consistency checks, as detailed in Paragraph A3 of Appendix A, shall be made at least once per month.

5 PROCEDURE

The procedure shall be as follows:

- (a) Obtain and record, for the asphalt to be tested, the source, nominal size, type and nominal layer thickness, and the reference density of the asphalt mix; and, for the nuclear gauge to be used, the serial number and the current calibration report number.
- (b) At the works site, obtain and record the field standard density count with the manufacturer's reference block placed on the material to be tested, in accordance with the procedure specified for the gauge by the manufacturer.
- (c) Select a test site on which density is to be determined and ensure that—
 - (i) loose material is swept or cleared off the surface; and
 - (ii) the surface is, essentially dry, flat and free of cracks and depressions.

NOTE: Cracking in the surface of the asphalt should not adversely affect the test results provided the gauge is so positioned that no crack extends from the source directly to the detector tubes, and provided the asphalt integrity has not been affected.

- (d) Using the scraper plate as a guide, drill or drive a hole to at least 25 mm greater than the required test depth. Ensure surface of the compacted asphalt is flat after removal of the drill rod.

NOTE: The required test depth is the maximum depth that allows both the probe to be located in the testing position, and the probe to remain in the layer being tested.

- (e) Place the gauge on the test site with its longitudinal axis in the direction of rolling, checking that it is firmly seated. To assist seating, it is permissible to use small quantities of fine material as detailed in Clause 4.7 to fill small surface voids, taking care to avoid placing fines in the hole. This material shall not form an added layer.

NOTE: Fines should not be used when testing open-graded asphalts, as they will fill the surface voids and affect the density reading.

- (f) Insert the probe into the hole to the required test depth. Move the gauge longitudinally so that the side of the probe nearest to the detector is in contact with the side of the hole. Record the depth of the probe and the nominal depth of the layer being tested.
- (g) Follow the gauge manufacturer's instructions to obtain at least one density reading with a count time of not less than 60 s. Record the density reading (ρ) and the corresponding density count.

NOTE: If desired, additional readings may be taken, and longer count times may be used. The gauge may be rotated 180° about the axis of the source rod, ensuring that the gauge is firmly seated, and another reading(s) taken. If more than one reading is taken, the density readings obtained may be averaged if the counts do not differ by more than 3%. Otherwise, repeat the test on an adjacent site.

6 CALCULATIONS

The following calculations shall be carried out, as appropriate:

- (a) If applicable, calculate the field density count ratio by dividing the density count by the field density standard count.
- (b) If applicable, calculate field density (ρ), in t/m^3 , at the test site, from the calibration coefficients, or read these values from the calibration charts or tables.