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Road and airfield surface characteristics - Test methods - Part 1: Measurement of pavement surface macrotexture depth using a volumetric patch technique

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Oberflächeneigenschaften - Prüfverfahren - Teil 1: Messung der Makrotexturtiefe der Deckschicht mit Hilfe einer volumetrischen Flecktechnik EVIEW

Caractéristiques de surface - Méthodes d'essai - Partie 1: Mesurage de la profondeur de macrotexture de la surface du revetement a l'aide d'une technique volumétrique

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Road and airfield surface characteristics - Test methods - Part 1: Measurement of pavement surface macrotexture depth using a volumetric patch technique

Caractéristiques de surface des routes et aéroports -Méthodes d'essai - Partie 1: Mesurage de la profondeur de macrotexture de la surface d'un revêtement à l'aide d'une technique volumétrique à la tache Oberflächeneigenschaften von Straßen und Flugplätzen -Prüfverfahren - Teil 1: Messung der Makrotexturtiefe der Fahrbahnoberfläche mit Hilfe eines volumetrischen Verfahrens

This European Standard was approved by CEN on 4 October 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and hotified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION COMITÉ EUROPÉEN DE NORMALISATION EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 227 "Road materials", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2001, and conflicting national standards shall be withdrawn at the latest by November 2001.

This European Standard is one of a series of standards as listed below:

EN 13036-1, Road and airfield surface characteristics — Test methods — Part 1: Measurement of pavement surface macrotexture depth using a volumetric patch technique.

00227174-2, Pavement surface characteristics — Test methods — Part 2: Measurement of megatexture using a profile metric technique.

prEN 13036-3, Road and airfield surface characteristics — Test methods — Part 3: Measurement of pavement surface horizontal drainability.

prEN 13036-4, Road and airfield surface characteristics — Test methods — Part 4: Method of measurement of skid resistance of a surface — The pendulum test NDARD PREVIEW

prEN 13036-5, Road and airfield surface characteristics **Test methods** — Part 5: Measurement of friction using dynamic systems — Determination of a European Friction Index.

prEN 13036-6, Road and airfield surface characteristics — Test methods — Part 6: Measurement of the influence of road surfaces on the traffic noise — The statistical pass-by method.

prEN 13036-7, Road and airfield surface characteristics — Test methods — Part 7: Single irregularity measurement of pavement surface courses — The straightedge test.

prEN 13036-8, Road and airfield surface characteristics — Test methods — Part 8: Measurement of the influence of road surfaces on traffic noise — The close proximity method.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This European Standard has been written in accordance with annex A of ISO 10844:1994.

The so-called "sand-patch method" has been used worldwide for many years to measure the road surface texture.

It relies on a given volume of sand which is spread out on a road surface. The sand is distributed to form a circular patch, the diameter of which is measured. By dividing the volume of sand with the area covered, a value is obtained which represents the average depth of the sand layer, i. e. an average "texture depth". The method is described in [2] of the Bibliography, but the procedure has been described and used even earlier.

However, a development of the sand-patch method, replacing sand with glass spheres, has been described in ASTM E 965-87 (see [1] of the Bibliography).

The method in this European Standard is largely based on ASTM E 965-87. However, a number of changes have been made, for example the use of only metric units and the avoidance of making references to other ASTM standards. Also, the layout has been adapted to the normal layout for European Standards.

The selection of the ASTM standard rather than the procedure described in BS 812-114 (see [3] of the Bibliography) is based on the fact the ASTM standard uses a material with closer specifications and that the ASTM standard is far more precise in its description of the test method.

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1 Scope

This European Standard specifies a method for determining the average depth of pavement surface macrotexture by careful application of a known volume of material on the surface and subsequent measurement of the total area covered. The technique is designed to provide an average depth value of only the pavement macrotexture and is considered insensitive to pavement microtexture characteristics.

This test method is suitable for field tests to determine the average macrotexture depth of a pavement surface. When used in conjunction with other physical tests, the macrotexture depth values derived from this test method can be used to determine the pavement skid resistance capability, noise characteristics and the suitability of paving materials or finishing techniques. When used with other tests, care should be taken that all tests are applied at the same location.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

ISO 565, Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings.

3 Test method

The standard materials and test apparatus consist of a quantity of uniform material, a container of known volume, a suitable wind screen or shield, brushes for cleaning the surface, a flat disc for spreading the material on the surface, and a ruler or other measuring device for determining the area covered by the material. A laboratory balance is also recommended to ensure consistent amounts for each measurement sample.

The test method involves spreading a known volume of material on a clean and dry pavement surface, measuring the area covered, and subsequently calculating the average depth between the bottom of the pavement surface voids and the tops of surface aggregate particles.

In spreading the material specified in this test method, the surface voids are completely filled flush to the tips of the surrounding aggregate particles.

Pavement aggregate particle shape, size and distribution are surface texture features not addressed in this method. The method is not meant to provide a complete assessment of pavement surface texture characteristics. In particular, care should be exercised in interpreting the result if the method is applied to porous surfaces and to deeply grooved surfaces.

The method can be applied to a wide range of surfaces. Nevertheless, care should be taken in interpreting results falling outside the range of 0,25 mm to 5 mm in texture depth.

4 Material and apparatus

The essential elements of the apparatus, shown in Figure 1, consist of the following:



Key

- 1 portable wind screen
- 2 spreading tool
- 3 surface cleaning brushes
- 4 sample cylinder
- 5 ruler

Figure 1 — Apparatus for measuring surface macrotexture depth

4.1 Material

Solid glass spheres being essentially round shall be used. Refer, for example, to reference [4] of the Bibliography. The spheres shall be graded to have a minimum of 90 % by weight passing a 0,25 mm sieve and retained on a 0,18 mm sieve complying with ISO 565. For availability of material, see for example references [1] and [5] of the Bibliography.

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4.2 Sample container

A cylindrical metal or plastic container with a predetermined internal volume of at least 25 000 mm³ (25 ml) shall be used to determine the volume of glass spheres spread.

4.3 Spreader tool

A flat, hard disc approximately 25 mm thick and 60 mm to 75 mm in diameter shall be used to spread the sand. The bottom surface or face of the disc shall be covered with a hard rubber material and a suitable handle can be attached to the top surface of the disc.

NOTE An ice-hockey puck is considered suitable for use as the hard rubber material in this test method.

4.4 Brushes

A stiff wire brush and a soft bristle brush shall be used to clean the pavement surface thoroughly prior to application of the material sample.

4.5 Windshield

A suitable screen or shield can be placed on the pavement surface to protect the material sample from the wind and turbulence created by traffic. An example is shown in Figure 1.

4.6 Scale and balance

A standard scale 300 mm or greater in length and having 1 mm divisions should be used.

Use of a laboratory balance, sensitive to 0,1 g, is recommended with this test method to provide additional control and to ensure that the mass of material used for the surface macrotexture depth measurement is constant.

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5 Procedure

5.1 Test surface

Inspect the pavement surface to be measured and select a dry, homogeneous area that contains no unique, localized features such as cracks and joints. Thoroughly clean the surface using the stiff wire brush first and subsequently using the soft bristle brush to remove any residue, debris or loosely bonded aggregate particles from the surface. Position the portable windshield around the surface test area.

5.2 Material sample

Fill the cylinder of known volume with dry material and gently tap the base of the cylinder several times on a rigid surface. Add more material to fill the cylinder to the top, and level with a straightedge. If a laboratory balance is available, determine the mass of material in the cylinder and use this mass of material sample for each measurement.

5.3 Determination

Pour the measured volume or mass of material on to the cleaned test surface. Carefully spread the material into a circular patch, with the disc tool, rubber-covered side down, filling the surface voids flush with the aggregate particle tips. Use a slight pressure on the hand, just enough to ensure that the disc will spread out the material so that the disc touches the surface aggregate particle tips.

Measure and record the diameter of the circular area covered by the material at a minimum of four equally spaced locations around the sample circumference. Calculate and record the average diameter.

For very smooth pavement surfaces where the patch diameters are greater than 300 mm, it is recommended that half the normal volume of material be used.

(1)

(2)

5.4 Number of test measurements

The same operator should perform at least four, randomly spaced measurements on a given test pavement surface type. The arithmetic average of the individual values shall be considered to be the average surface texture (macrotexture) depth of the tested pavement surface.

6 Calculation

6.1 Cylinder volume

Calculate the internal volume of the sample cylinder as follows:

$$V = \pi d^2 h / 4$$

where

V is the internal cylinder volume, expressed in cubic millimeters (mm³);

d is the internal cylinder diameter, expressed in millimeters (mm);

h is the cylinder height, expressed in millimeters (mm).

6.2 Surface mean texture depth

Calculate the mean texture depth, *MTD*, using the following equation:

 $MTD = 4V / \pi D^2$

where

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MTD is the mean texture depth, expressed in millimeters (mm);

- V is the sample volume (i. e. internal cylinder volume), expressed in cubic millimeters (mm³);
- *D* is the average diameter of the area covered by the material, expressed in millimeters (mm).

7 Safety considerations

This test method can involve hazardous operations when measurements are made on trafficked pavements. The European Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this European Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

8 Test report

The test report for each pavement test surface shall contain data on the following items:

- a) location and identification of test pavement surface;
- b) date;
- c) identification of the operator;
- d) volume of material used for each test measurement, in cubic millimeters;
- e) number of test measurements;