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Značilnosti cestnih in vzletnih površin - 5. del: Postopek določanja torne sposobnosti vozne površine z opremo za vzdolžne meritve s kontroliranim drsenjem (LFCRDK): ROAR (Road Analyser and Recorder of Norsemeter)

Road and airfield surface characteristics - Part 5: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal controlled slip (LFCRDK): ROAR (Road Analyser and Recorder of Norsemeter)

Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Verwendung eines Geräts mit geregeltem Schlupf in Längsrichtung (LFCRDK): das in Dänemark verwendete ROAR-Gerät (Road Analyser und Recorder of Norsemeter)

Caractéristiques de surface des routes et aéroports - Partie 5 : Mode opératoire de détermination de l'adhérence d'un revêtement de chaussée à l'aide d'un dispositif à frottement longitudinal contrôlé (CFLRDK) : le ROAR (Analyseur de Route et Enregistreur du Norsemeter)

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Road and airfield surface characteristics - Part 5: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal controlled slip (LFCRDK): ROAR (Road Analyser and Recorder of Norsemeter)

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Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 5: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Verwendung eines Geräts mit geregeltem Schlupf in Längsrichtung (LFCRDK): das in Dänemark verwendete ROAR-Gerät (Road Analyser and Recorder of Norsemeter)

This Technical Specification (CEN/TS) was approved by CEN on 27 June 2009 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (CEN/TS 15901-5:2009) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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1 Scope

This Technical Specification describes a method for determining the skid resistance of a surface by measurement of the longitudinal friction coefficient $LFCN$.

The method provides a measure of the wet skid resistance properties of a bound surface by measurement of the longitudinal friction coefficient using a continuous reading braked wheel fixed-slip device.

The test tyre is dragged over a pre-wetted pavement under controlled speed conditions while the test tyre is parallel to the direction of motion and perpendicular to the pavement.

This Technical Specification covers the operation of the Road Analyser and Recorder of Norsemeter (ROAR). The fixed slip ratio is 20 %.

A machine conforming to the general characteristics of the ROAR and the specific provisions of this Technical Specification may also be used for the tests.

In addition to friction measurements, to determine the macrotexture of the pavement surface a laser system is used. This system is placed in front of the towing vehicle in order to measure the macrotexture (mean profile depth – MPD) on dry pavements and on the same path as the skid resistance measurement is done. The standard for this measurement and the device is described in EN ISO 13473-1.

The skid resistance of a pavement is determined by friction measurements and measurements of pavement texture. The skid resistance may be reported either as friction measurement or as a combination of friction and texture measurements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 13473-1, *Characterization of pavement texture by use of surface profiles – Part 1: Determination of Mean Profile Depth (ISO 13473-1:1997)*

ISO 13473-2, *Characterization of pavement texture by use of surface profiles – Part 2: Terminology and basic requirements related to pavement texture profile analysis*

3 Recommended uses

The ROAR is used in the following fields of application:

— network monitoring (Pavement Management);

— approval of new surfacing;

— measurements for project-level compliance;

— investigation of surface skid resistance;

— comparative measurements among different devices;

— research measurements.

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
friction
resistance to relative motion between two bodies in contact, the frictional force being the force, acting tangentially in the contact area, which is measured by a friction-measuring device

4.2
braking force coefficient
ratio between the longitudinal frictional force and the load on the test tyre, the test tyre mass and the rim mass, which is without dimension

4.3
skid resistance
characterisation of the friction of a road surface when measured in accordance with a standardised method

4.4
wet road skid resistance
property of a trafficked surface that limits relative movement between the surface and the part of a vehicle tyre in contact with the surface, when lubricated with a film of water

NOTE Factors that contribute to skid resistance are tyre pressure, contact area, tread pattern and rubber composition: the alignment, texture, surface contamination and characteristics of the road surface, vehicle speed and weather conditions.

The skid resistance of a surface in Europe varies seasonally. Generally, wet skid resistance is higher in winter as a result of the effects of wet detritus and the effects of frost and wear by tyres on microtexture and macrotexture. Wet skid resistance is lower in summer as a result of dry polishing by tyres in the presence of fine detritus.

The change in skid resistance of a surface in service is affected by the volume of traffic and the composition of the traffic, i.e. cars, buses, commercial vehicles of different sizes, as the tyres of these vehicles polish and/or wear the surfacing material in different ways. The geometry of the road will affect the change in skid resistance. Generally, tyres polish less on straight roads than on bends.

Where the surface contains aggregate with a coating of binders, e.g. bitumen, resin or Portland cement, the skid resistance can change as the coating is worn away by tyres.

4.5
friction coefficient ROAR
μ
ratio between the horizontal force in the direction of the motion that can be activated between the test wheel and the wet pavement and the vertical wheel load accomplished under controlled slipping conditions

NOTE The controlled slipping condition is achieved by a hydraulic brake system. If the vehicle is in motion, the test wheel slides or slips in the forward direction.

4.6
microtexture
deviation of a pavement from a true planar pavement with characteristic dimensions along the pavement of less than 0,5 mm, corresponding to texture wavelengths with one-third-octave bands and up to 0,5 mm centre wavelengths

NOTE 1 Peak to peak amplitudes normally vary in the range 0,001 mm to 0,5 mm.

NOTE 2 Microtexture is a primary component in skid resistance at slow speeds. Those devices that utilize a relatively low slip speed primarily measure the component of friction affected by microtexture.

4.7
macrotexture
deviation of a pavement from a true planar pavement with characteristic dimensions along the pavement of 0,5 mm to 50 mm, corresponding to texture wavelengths with one-third-octave bands including the range 0,63 mm to 50 mm centre wavelengths

NOTE 1 Peak to peak amplitudes normally vary in the range 0,1 mm to 20 mm.

NOTE 2 Macrotexture is a major factor influencing skid resistance at high speeds but it also has an effect at low speeds.

4.8
Mean Profile Depth
MPD
descriptor of macrotexture, obtained from a texture profile measurement as defined in EN ISO 13473-1 and ISO 13473-2

4.9
calibration
periodic adjustment of the offset, the gain and the linearity of the output of a measurement method so that all the calibrated devices of a particular type deliver the same value within a known and accepted range of uncertainty, when measuring under identical conditions within given boundaries or parameters

4.10
Road Analyser Recorder acronym
ROAR
device developed by the Norsemeter cooperation to perform routine, continuous measurements of friction for long road-sections

NOTE A device conforming to the general characteristics of the ROAR and the specific provisions of this document needs to be used for the tests.

4.11
operating speed
speed at which the device traverses the test surface

4.12
slip speed
relative speed between the tyre and the pavement in the contact area

4.13
slip ratio
slip speed divided by the operating speed

4.14
wheelpath
parts of the pavement where the majority of the vehicle wheel passes are concentrated

NOTE The wheelpath is not a fixed location on a pavement surface. On a worn pavement, the wheelpath can usually be identified easily visually. On a new laid surface, the position of the wheelpath needs to be estimated by experienced operators.

For special circumstances such as acceptance tests, a particular path can be defined, for example (700 ± 150) mm from the edge of the running lane of a road.

4.15
theoretical water film thickness
thickness of a water film between a measuring tyre and a test pavement, assuming the pavement has zero texture depth

5 Safety

Safety measures shall be in place to maintain safe working practice in accordance with current regulations, and to ensure the safety of other users of the area being measured, including measures to control traffic as necessary.

NOTE The wetting of pavements can have an effect on other road users and every effort should be made to ensure that they do not have to make any sudden changes in speed or direction.

When measuring skid resistance on roads under traffic the device may operate at speeds different to normal road speeds and as a result can create a hazard for other road users. So the specified test speed for tests in accordance with this document should be taken into account.

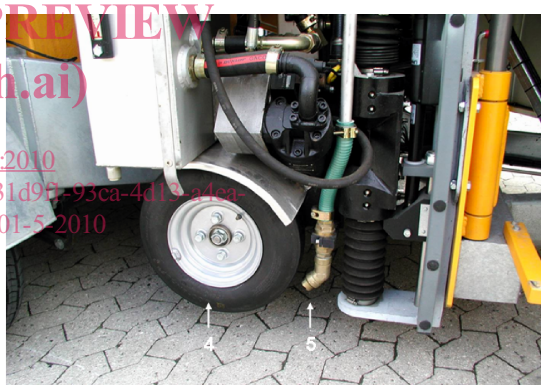
Tests that involve water deposition should not be carried out if there is a risk of water freezing on the pavement.

6 Essential characteristics

6.1 Principle of measurements

Devices complying with this document operate on the principle that the measuring wheel is to give a fixed slip ratio of 20 % between it and the speed of travel along the wetted pavement surface. The system is also capable of measuring skid resistance at a pre-set slip ratio, which can be fixed from 1 % to 99 %. The wheel slips as it is towed along the wetted pavement surface at a constant speed and the slipping force is measured. The measurement is continuous.

a) Overview of the ROAR



b) Skid resistance device

Key

1 Laser sensors
2 Towing vehicle
3 Roar units and watertank
4 Measuring wheel
5 Water system

Figure 1 — The ROAR system

6.2 Description of ROAR

The device is a trailer having drive wheels and a single loaded test wheel. A typical device is illustrated in Figures 1 a) and 1 b).

Skid resistance measurements are carried out by a hydraulic brake system providing continuous data which are collected, processed and stored. The pre-wetting function enables the specification of a defined water film thickness of 0,5 mm for all measurements. Optional theoretical water depth as 0,0 mm and 1,0 mm may be used.