SLOVENSKI STANDARD
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Značilnosti cestnih in vzletnih površin - 2. del: Postopek določanja torne sposobnosti vozne površine z opremo za vzdolžne meritve s kontroliranim drsenjem (LFCRNL): ROAR (Road Analyser and Recorder of Norsemeter)

Road and airfield surface characteristics - Part 2: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal controlled slip (LFCRNL): ROAR (Road Analyser and Recorder of Norsemeter)

Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 2: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Verwendung eines Geräts mit geregeltem Schlupf in Längsrichtung (LFCRNL): das in den Niederlanden verwendete ROAR-Gerät (Road-Analyser and Recorder of Norsemeter)

Caractéristiques de surface des routes et aéroports - Partie 2 : Mode opératoire de détermination de l'adhérence d'un revêtement de chaussée à l'aide d'un dispositif à frottement longitudinal contrôlé (CFLRNL): le ROAR (Analyseur de route et Enregistreur du Norsemeter)

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93.080.10	Gradnja cest	Road construction
93.120	Gradnja letališč	Construction of airports

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (CEN/TS 15901-2:2009) 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 wet-road skid resistance of a surface by measuring the $LFCR_{NL}$ using the Road Analyser and Recorder of Norsemeter (ROAR).

In addition to the friction measurement also measurements of pavement texture may be performed.

The method provides friction coefficient measurements of pavements by using a hydraulically braked test wheel at a pre-set slip ratio, which may be fixed from 5 % to 95 %. Default value for the Netherlands is 86 %.

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

To determine the macrotexture of the pavement a laser system is used. This system is placed in front of the towing vehicle in order to measure the macrotexture on dry pavements and on the same path as the skid resistance measurement is done. The standard for this measurement and the used measuring device are well described in EN ISO 13473-1 and ISO 13473-2.

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*

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3 Fields of application

The method provides a means for the evaluation of the skid resistance of a road surface. It is suitable for use in the following situations:

— for routine measurements of a road in service, either network monitoring for Pavement Management, or measurements on project-level;

— approval of new works;

— research measurements.

4 Terms and definitions

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

4.1
skid resistance
characterisation of the friction of a road surface when measured in accordance with a standardised method

4.2
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 include the tyre pressure, contact area, tread pattern and rubber composition; the alignment, texture, surface contamination, and characteristics of the road surface; the vehicle speed; and the weather conditions.

The skid resistance of a road 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 away 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 binder, e.g. bitumen, resin or Portland cement, the skid resistance will change as the coating is worn away by tyres.

4.3
bound surface
top layer or surface course of a road with the aggregates secured permanently in place

NOTE Aggregates are commonly secured in place by bitumen or Portland cement.

4.4
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

4.5
contact area
overall area of the road surface instantaneously in contact with a tyre

NOTE This term describes the overall area generally covered by the tyre. Due to the effects of surface texture or any tyre tread pattern, not all of the tyre or road surface in the contact area can be in contact at any instant.

4.6
longitudinal friction coefficient
ratio between horizontal force (drag) and vertical load (load) for a braked wheel in controlled conditions, which is normally a decimal number quoted to two significant figures

NOTE LFC varies depending on the slip ratio of the device and the operational speed.

4.7
$LFCR_{NL}$
longitudinal friction coefficient measured with a device conforming with this Technical Specification

4.8
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.

4.9
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.

4.10
mean profile depth
descriptor of macrotexture, obtained from a texture profile measurement as defined in EN ISO 13473-1 and ISO 13473-2

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

4.12
repeatability
r
maximum difference expected between two measurements made by the same machine, with the same tyre, operated by the same crew on the same section of road in a short space of time, with a probability of 95 %

4.13
reproducibility
R
maximum difference expected between two measurements made by different machines with different tyres using different crews on the same section of road in a short space of time, with a probability of 95 %

4.14
Road Analyser Recorder
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 Technical Specification should be used for the tests.

4.15
sampling interval
distance over which responses of the sensors are sampled to determine a single measurement of the recorded variables

NOTE 1 The sampling length depends upon the detailed operation of device and its recording system; a number of samples may be combined to determine a measurement for a subsection.

NOTE 2 This should not be confused with horizontal resolution, which is the shortest distance over which a change in the measured parameter can be detected.

4.16
slip speed
relative speed between the test tyre and the travelled surface in the contact area

4.17
slip ratio
slip speed divided by the operating speed

4.18
theoretical water film thickness
theoretical thickness of a water film deposited on the surface in front of the measuring tyre, assuming the surface has zero texture depth

4.19
test section
length of road between defined points (e.g. location references, specific features, or measured distances) comprising a number of subsections over which a continuous sequence of measurements is made

4.20
wheelpath
part of the pavement surface where the majority of vehicle wheel passes are concentrated

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

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

4.21
near side wheelpath
wheelpath that is closest to the edge of the road in the normal direction of travel, which is, for countries that normally drive on the right, the right-hand side, and, for countries that normally drive on the left, the left-hand side

5 Safety

Safety measures shall maintain safe working conditions in accordance with current regulations to ensure the safety of other road users, including measures to control traffic if 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 Technical Specification should be taken into account.

Testing should not be carried out if there is a risk of water freezing on the road.

6 Principle of measurements and description of the device

6.1 Principle of measurements

The method performs continuous measurement of longitudinal friction coefficient by using a fixed pre-set slip ratio of 86 %. The system is capable of friction coefficient measurements at other pre-set slip ratios varying from 5 % to 95 %.

6.2 Description of the device

Skid resistance measurements of machines meeting this Technical Specification shall use the Road Analyser and Recorder of Norsemeter (ROAR) measuring units.

One or two measuring units shall be mounted either in a trailer or at the rear of a truck. The measuring units shall be mounted in the position of the right wheel track, the left wheel track and/or in the centre line of the trailer or truck (see Figure 1 for a typical example).