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Značilnosti cestnih in vzletnih površin - 9. del: Postopek določanja torne sposobnosti vozne površine z meritvijo količnika trenja (LFCD): DWWNL

Road and airfield surface characteristics - Part 9: Procedure for determining the skid resistance of a pavement surface by measurement of the longitudinal friction coefficient (LFCD): DWWNL skid resistance trailer

Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 9: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Messung des Reibungskoeffizienten in Längsrichtung (LFCD): das RWS/NL-Griffigkeitsmessgerät (Anhänger)

Caractéristiques de surface des routes et aéroports - Partie 9: Mode opératoire de détermination de l'adhérence d'un revêtement de chaussée en procédant au mesurage du coefficient de frottement longitudinal (CFLD) : la remorque d'adhérence DWW NL

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Foreword

This document (CEN/TS 15901-9:2009) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by DIN.

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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 LFCD.

The method provides a measure of the wet-road skid resistance properties of a bound surface by measurement of the longitudinal friction coefficient at a fixed slip ratio of 86 % and at a controlled speed. The method has been developed for use on roads, but is also applicable to other paved areas such as airports.

This Technical Specification covers the following proprietary devices:

RWS_{NL} skid resistance trailer device, which has been developed by the Rijkswaterstaat in the Netherlands. The device uses a standard PIARC smooth test tyre being dragged over a pre-wetted pavement under controlled speed conditions while its running direction is parallel to the direction of motion and perpendicular to the pavement. Several RWS skid resistance trailer devices have been manufactured under license and operate in combination with variable towing vehicles.

2 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:

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

— approval of new works;

— research measurements.

3 Terms and definitions

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

3.1
skid resistance
characterisation of the friction of a road surface when measured in accordance with a standardised method

3.2
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.

3.3
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.

3.4
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

3.5
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.

3.6
RWS_{NL} skid resistance trailer
device developed by the Rijkswaterstaat in the Netherlands that uses the longitudinal force principle to make routine measurements of skid resistance continuously

NOTE All devices are manufactured under license from RWS.

3.7
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.

3.8
LFCD
longitudinal friction coefficient measured with a device conforming with this Technical Specification

3.9
operating speed
speed at which the device traverses the test surface

3.10
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 %

3.11
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 %

3.12
slip speed
relative speed between the test tyre and the travelled surface in the contact area

3.13
slip ratio
slip speed divided by the operating speed

3.14
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.

3.15
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

3.16
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

3.17
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.

3.18
near side wheelpath
wheelpath that is closest to the edge of the road in the normal direction of travel and that, for countries that normally drive on the right, is the right-hand side, and, for countries that normally drive on the left, is the left-hand side

4 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.

5 Principle of measurements and description of the device

5.1 Principle of measurements

The method performs continuous measurement of longitudinal friction coefficient by using a fixed slip ratio of 86 % on a pre-wetted surface and a controlled speed.

5.2 Description of the device

Skid resistance measurements of machines meeting this Technical Specification shall use the RWS skid resistance trailer device (see Figure 1 for a typical example).

This trailer device is one with two bearing (transport) wheels. The trailer is connected to a towing vehicle. In the centreline of the bearing wheels a measuring wheel is mounted fitted with a standard test tyre. The measuring wheel is connected via a transmission to one of the bearing wheels realising a slip ratio of 86 %. This means that the circumferential speed of the standard test tyre is 14 % of that of the bearing wheels.

In the towing vehicle the necessary electronic systems for collecting, processing and storing of the continuously collected data is mounted.

In the towing vehicle also a water supply system is mounted, which enables the specification of a theoretically defined water film thickness of 0,5 mm immediately in front of the test wheel for all measurements.

Figure 1 — Typical example of the Dutch RWS_{NL} skid resistance trailer device

6 Key characteristics

6.1 General

Below, the minimum requirements to insure a good repeatability and reproducibility of the devices results are listed.

6.2 Test speed

During tests the vehicle shall be capable of maintaining speeds of 40 km/h to 80 km/h. Allowable maximum deviation form target test speed is 5 %.The output is directly displayed to the driver and simultaneously recorded.