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Značilnosti cestnih in letaliških površin - 12. del: Postopek določanja torne sposobnosti vozne površine z mehanizmom za kontroliran zdrs v vzdolžni smeri: BV 11 in SFT (Saab friction tester)

Road and airfield surface characteristics - Part 12: Procedure for determining the skid resistance of a pavement surface using a device with longitudinal controlled slip: the BV 11 and Saab friction tester (SFT)

Oberflächeneigenschaften von Straßen und Flugplätzen - Teil 12: Verfahren zur Bestimmung der Griffigkeit von Fahrbahndecken durch Verwendung eines Geräts mit geregeltem Schlupf in Längsrichtung: das BV-11-Gerät und das Saab-Reibungsmessgerät (Saab-Friction-Tester)

Caractéristiques de surface des revêtements de chaussée des routes et des aérodromes - Partie 12: Mode opératoire de détermination de l'adhérence de la surface d'un revêtement de chaussée à l'aide d'un dispositif à frottement longitudinal contrôlé, le BV 11 et le dispositif d'essai de frottement Saab (SFT)

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This Technical Specification (CEN/TS) was approved by CEN on 14 September 2010 for provisional application.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Contents

Foreword

This document (CEN/TS 15901-12:2011) 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 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, parallel to the direction of motion and perpendicular to a pre-wetted pavement under controlled speed conditions.

This document covers the operation of the BV11 and SAAB Friction Tester (SFT) with a fixed slip ratio of 17 %.

Machines conforming to the general characteristics of the BV11 and SAAB Friction Tester and with the specific provisions of this document may also be used for the tests.

2 Recommended uses

The BV11 and SFT are used in the following fields of application:

— approval of new surfacing;

— measurements for project-level compliance;

— investigation of surface skid resistance;

— comparative measurements among different devices;

— research measurements;

— for airfield use other specifications for speed, water film and tyre type and pressure are used than on road pavements.

3 Terms and definitions

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

3.1
friction
resistance to relative motion between two bodies in contact

NOTE The frictional force is the force, acting tangentially in the contact area.

3.2
braking force coefficient
ratio between the longitudinal frictional force and the load on the test tyre, the test tyre mass and the rim mass

NOTE This coefficient is without dimension.

3.3
wet pavement 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 surface, the vehicle speed, and the weather conditions.

The skid resistance of road surfaces in Europe varies seasonally. Generally, wet skid resistance is higher in winter conditions as a result of the effects of wet detritus and the effects of frost and wear of 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 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 binder, e.g. bitumen, resin or Portland cement, the skid resistance will change as the coating is worn away by tyres.

3.4
friction coefficient BV11 and SFT
μ
ratio between the horizontal force in the direction of the motion that can be activated between the test wheel and the wet surface and the vertical wheel load accomplished under controlled slipping conditions

3.5
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

3.6
operating speed
speed at which the device measures the surface characteristics

3.7
slip speed
relative speed between the tyre and the surface in the contact area

3.8
slip ratio
quotient of the slip speed divided by the operating speed

3.9
wheelpath
parts of the pavement surface where the majority of the vehicle wheel passes are concentrated

NOTE The wheel path is not a fixed location on a pavement surface. On a worn pavement, the wheel path is usually easily identified visually. On a newly laid surface, the position of the wheel path has 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.

3.10
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 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 may 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.

5 Essential characteristics

5.1 Principle of measurements

Devices complying with this document operate on the principle that the measuring wheel is to give a fixed slip ratio of 17 % between it and the speed of travel along the wetted pavement surface. The wheel slips as it is towed along the wetted pavement surface at a constant speed and the slipping force is measured. Typical devices are illustrated in Figure 1

Figure 1 — The SAAB friction tester

Figure 2 — BV11 tester

5.2 Description of BV 11 and SAAB friction tester

The device is either built as a towed trailer (BV11) or built into a vehicle. The measuring wheel is located between two reference wheels. The measuring wheel is forced to rotate slower than the reference wheels so a slip of 17 % is achieved. The measuring wheel is loaded with a vertical force of 1 000 N.

Skid resistance measurements are carried out by a sensor 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 except for airfields where 1,0 mm should be used.

6 Key characteristics

6.1 General

The minimum requirements to ensure a good repeatability and reproducibility of the devices results are listed below.

6.2 Test speed

During tests the vehicle shall maintain a speed of (70 ± 5) km/h (except for airfields where 130 km/h should be used)

6.3 Braking system

The slip ratio are realised with a mechanical system and are within the operational range stable with a resolution of 1 %.

6.4 Static wheel load

The apparatus is designed to provide an equal static load of (1 000 ± 5) N to the test wheel.

6.5 Test wheel arrangement

A mechanism raises and lowers the test wheel arrangement from and to the ground.

6.6 Test tyre

The measuring test tyre is of the type Trelleborg T49 with the dimensions 4.00-8/4. The tyre pressure shall be (140 ± 10) kPa. The thread depth should be more than 2 mm. On airfields the tyre should be of type Trelleborg Unitester or Saab Aero with a pressure of 700 kPa.

6.7 Pavement wetting system, water film thickness

The pavement wetting system consists of a watering nozzle and a water pump. Section lengths of up to 20 km can be measured with one water tank filling.

The water flow is controlled by a manually adjustable control valve to apply the water to the pavement in front of the test tyre The quantity of water for pavement wetting is regulated for each operating speed to a constant theoretical water film thickness of 0,5 mm.

NOTE The water film thickness is called “theoretical” because it means the thickness on a perfectly dense, smooth and horizontal pavement. The real water film thickness depends on the pavement on which it is applied. For example on porous pavements the water depth is depending on the real porosity of the pavement.

6.8 General requirements for measuring

— The skid resistance measurements shall be performed at ambient temperatures above 5 °C;

— the skid resistance measurements shall not be performed when it is raining or when water is sprayed from the pavement by the traffic;

— the measured surface should be clean from debris;

— measurements should be performed in either the left or right wheel track;

— if the result between two repeated runs differs more than 10 % and one of the values is less than 0,5 a complete renewed test should be done.