

Road marking materials - Wear simulators

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English version

Road marking materials - Wear simulators

Produits de marquage routier - Simulateurs d'usure

Straßenmarkierungsmaterialien - Verschleißsimulator

This European Standard was approved by CEN on 7 March 2001.

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 notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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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 226 "Road equipment", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by October 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

The annexes A, C and D are normative. The annexes B, E and F are informative.

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

Road markings are carried out by the application of road marking materials to the road surface. Road marking materials include materials to be applied in a liquid form such as solvent-based paints or waterborne, thermoplastic materials in a molten state and cold-hardening materials in a mixture of reacting components. Road marking materials further include preformed materials applied to the road surface by heat, pressure, adhesives or by other means.

Some materials are used for temporary road marking and others materials for permanent road marking. Some materials, e.g. paints, are applied in a thin layer, other materials, e.g. thermoplastic materials, are applied in thicker layers, that or less cover the road surface texture. Some materials are also applied by methods resulting in a lasting pattern in the road marking surface, such as in a profiled road marking. Sometimes one material is used for the base of a profiled road marking and another for the profiles.

Some drop-on materials conforming to EN 1423 “ Road marking materials – Drop on materials – Glass beads, antiskid aggregates and mixtures of the two” are often added to the surface of the road marking during the application process in order to improve the performance of the road marking either for an initial period or permanently. There are a number of drop-on materials available and different methods for applying them are in use.

In wear simulator tests, a road marking material is applied on test plates to form a road marking. The performance of this road marking is studied during exposure to the conditions of simulated traffic abrasion at a wear simulator facility.

The wear simulator simulates the traffic load on a road marking in the laboratory. The test is not to be regarded as being equivalent to road trials or practice.

1 Scope

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This European Standard describes the methods for wear simulator tests on road marking materials for use as both permanent and temporary road markings including those with increased retroreflection under wet conditions, without road studs.

It gives requirements for wear simulator facilities, for application on the test plates, for parameters to be measured, frequency of the measurements and for expression of the results as a test report.

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).

EN 1436

Road marking materials – Road marking performance for road users

EN 1824:1998

Road marking materials – Road trials

ENV 13459-1

Road marking materials – Quality control – Part 1: Sampling from storage and testing

ENV 13459-2:1999

Road marking materials – Quality control – Part 2: Guidelines for preparing quality plans for materials application

3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1

wear simulator

equipment comprising one or more free running wheels with loaded axles, a number of test plates mounted in a plane and driving mechanism capable of a relative movement, in which the wheel(s) overrun the test plates repeatedly

NOTE Other wear simulators have stationary test plates, while the wheels move in a circle or in an ellipse, or back and forth.

3.2

support angle

angle between a plane perpendicular to the axle of the loading wheel and the vertical

3.3

steering angle

angle between a plane perpendicular to the axle of the loading wheel and a plane tangential to the movement of the loaded wheel relative to the test plates

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3.4

wheel roll-over

number of loading wheels (or, in case of wheels in tandem, pairs of loading wheels) that have passed over a test plate

NOTE If wheels are set to track across the samples between wheel passes, the wheel roll-overs are not necessarily the number of wheels that have rolled over any specific area of the test plate. In all cases, some areas of the test plates (in particular, the edges) will remain untracked.

3.5

erosion

loss of road marking on the test plate during wear simulator test

3.6

measurement area

measurement area is the summary of those areas of all the test plates of one tested product which are subject to test tyre roll-overs, which makes it possible to determine the required measurements

3.7

control plate

test plate of a standard material and with a standard road marking material included in each test run for indication of correct procedure

4 Requirements

4.1 Wear simulator tests and their testing conditions

4.1.1 General specification of test plates

4.1.1.1 Size

The size of the test plates shall be sufficient both for the wheels to pass entirely over the plate and for the necessary measurements to be performed.

The dimensions of the test plates shall be at least the following:

- length (parallel to line marking) 300 mm
- width (perpendicular to line marking) 200 mm
- thickness the thickness shall guarantee sufficient rigidity

The test plate shall be long enough to ensure that, in the test, the wheels tracks the plate so that at no time does any part of a wheel travel over the outer 25 mm on either side of the test plate.

The dimensions of the test plate shall be such that the applied road marking does not exceed the edges of the test plate parallel to the marking direction.

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4.1.1.2 Test plates material and surface condition (standards.iteh.ai)

The nature and roughness of the test plates selected for the test shall be recorded. The test plates shall be manufactured of sufficient rigidity to be able to be handled without obvious bending or breaking up at temperatures up to 60 °C.

From each batch of test plates, one representative plate per hundred (or part thereof) shall be tested under the standard regime being operated but without a road marking being applied. The batch shall be acceptable providing the representative plates have no deformation greater than 2 mm, no cracks and no breaks or disintegration at the end of the test.

The deformation shall be determined by the difference between the depth of the rut relative to the original datum.

The test report shall include an account of the texture depth determined by the method described in EN 1824:1998, annex B.

NOTE 1 When preparing test plate surfaces, precautions should be taken to assume that the test results will not be influenced by a transfer of test plate material to the road marking. Preparing test plates by high-pressure water cleaning is recommended.

NOTE 2 There is evidence that the texture depth has an influence on the result of wear simulator tests, at least for materials applied in thin layers.

4.1.1.3 Test plate orientation

The test plates shall be aligned in the wear simulator so that the road markings are perpendicular or parallel to the movement of the loading wheels relative to the test plates. The test report shall include whether the road markings are aligned perpendicular or parallel to the movement of the loading wheels relative to the test plates.

4.1.2 Loading wheel configuration

The test report shall include details of the wheel configuration including:

- the number of wheels in parallel which will pass over a test plate at the same time; and
- whether the wheel(s) is(are) stationary laterally or they track across the test plates.

If the wheel(s) track laterally, the test report shall include the total sideways distance that a wheel will move and the number of revolutions for one complete cycle of tracking.

For circular wear simulators, the diameter of the circle through which the loading wheel(s) rotate relative to the test plates shall also be included in the report.

4.1.3 Test conditions

4.1.3.1 Test conditions during application

Road marking materials shall be applied when the air temperature is between +10 °C and + 35 °C and relative humidity is below a maximum of 80 %.

The prevailing climatic conditions during application shall be measured with normal thermometer (accuracy $\pm 1,0$ °C) and hygrometer (accuracy ± 5 %) and reported.

4.1.3.2 Test conditions when determining no pickup-time

While determining the no pickup-time the air temperature, relative air humidity and exchanged air quantity in the climatic chamber shall be measured, kept constant and reported (see annex A).

4.1.3.3 Test conditions during wear simulator tests

The air temperature shall be used at least as the minimum valid parameter, but the temperature of the test plate during the test shall be measured by an infrared thermometer with automatic recording and included in the report.

4.2 Technical conditions

4.2.1 Technical conditions for application

Road marking materials shall be applied using the type of application (e.g. spray or extrusion) used in practice.

When a special method of application is necessary, it shall be recorded in the application report and in the test report.

The application shall be carried out in such a way that:

- layer thickness;
- layer weight; and
- the quantity of drop on materials

does not differ by more than 10 % from the required amounts specified by the manufacturer. The distribution of road marking material and drop-on materials shall be uniform over the width of the test marking and over the length of all test plates used.

NOTE An example of an application report is provided in annex B.

4.2.2 Technical conditions for wear simulator tests

In any test, the following parameters shall be defined quantitatively with tolerances and the values included in the report:

- tyre pressure of the loading wheel(s) in bar;
- load on the test plate from a single loading wheel, measured when stationary in kilonewtons [kN];
- support angle of the loading wheel(s) in degrees [°];
- steering angle of the loading wheel(s) in degrees [°];
- linear speed of the loading wheel(s) relative to test plates in kilometres per hour [km/h];
- driving direction;
- driving cycles;
- number of wheel roll-overs.

If the following parameters are also used they shall be defined quantitatively with tolerances and the values included in the report:

- water;
- fine aggregate/filler to stated grading; and
- ultraviolet light.

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NOTE 1 The number and the type of test tyres should be chosen in such a way that the tyre will not affect the visibility of the road marking under the chosen climatic conditions.

NOTE 2 The amount of the steering angle is important for the amount of abrasion, the value of the support angle is important for the nature of abrasion.

4.3 Test operation

The test plates, together with the road marking applied for test purposes, shall not be used in wear simulator tests before the applied road marking material has completely dried or hardened in accordance with the instructions of the manufacturer.

A sufficient area of the same material shall be tested with the same marking material in order to ensure that the repeatability of the test can be checked.

The location of the test plates can be chosen randomly or orderly.

The test operation (test run) shall be interrupted in a way which corresponds to the chosen periodicity and number of wheel roll-overs.

The end of the test can also be determined by the number of wheel roll-overs necessary until the value of a given requirement goes under a certain fixed minimum.

The following parameters shall be checked, reported and adjusted, if necessary, after each interruption in test runs, at least once a day:

- tyre pressure of the loading wheel(s);

- support angle of the loading wheel(s);
- steering angle of the loading wheel(s); and
- static load applied by the wheel(s).

The values and tolerances of these parameters shall be fixed depending of the type of equipment.

The following items shall be monitored continuously:

- room temperature; and
- pavement temperature.

At least one test plate of a standard material and with a standard road marking material shall be included in each test run for indication of correct procedure (control plate). Measurements shall only commence if the result on the standard road marking material on the control plate does not deviate from the known and controlled characteristics in excess of the following listed percentages when evaluated on the control plate:

- 15 % for erosion
- 15 % for day-time visibility & night-time visibility
- 10 % for skid resistance.

The entire test run shall be considered void, if deviations are higher than those stated above, then it may be assumed that changes are present (e.g., test tyres) which are not explainable by means of adjustment parameters.

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4.4 Sampling

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For identification of tested road marking materials and for laboratory tests if necessary samples shall be taken according to ENV 13459-1 from each road marking material, from all of its components in case of a multiple component material, and from drop-on materials.

NOTE 1 For materials used in more than one application, it is sufficient to take samples in connection with one application only.

NOTE 2 Additional specifications for samples, e.g. of the quantities for sampling, can be included in the sampling process.

4.5 Measurements in relation to application

4.5.1 Measurement of no pickup-time

The no pickup-time shall be measured only for paints and cold plastics. The no pickup-time shall be measured in conjunction with the application of a road marking material as specified in annex A.

NOTE The method described in annex A is a modification of the method described in EN 1824 because the test conditions are kept constant.

4.5.2 Weight determination

During the application of a road marking material, the total applied weight of the road marking material shall be determined for each of the test plates. For this determination one of the methods described in EN 1824 and ENV 13459-2:1999, annex G shall be used.