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Gradbeni proizvodi - Ocenjevanje sproščanja nevarnih snovi - 2. del: Horizontalni dinamični preskus izluževanja s površine

Construction products - Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Teil 2: Horizontale dynamische Oberflächenauslaugprüfung

Produits de construction - Evaluation de l'émission de substances dangereuses - Partie 2: Essais horizontaux et dynamiques de la lixivation des surfaces

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Construction products: Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test

Produits de construction - Évaluation du relargage de substances dangereuses - Partie 2 : Essai dynamique horizontal de lixiviation de surface

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Teil 2: Horizontale dynamische Oberflächenauslaugprüfung

This European Standard was approved by CEN on 30 July 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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EN 16637-2:2023 (E)

European foreword

This document (EN 16637-2:2023) has been prepared by Technical Committee CEN/TC 351 “Construction products: Assessment of release of dangerous substances”, the secretariat of which is held by NEN.

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of an identical text or by endorsement, at the latest by May 2024 and conflicting national standards shall be withdrawn at the latest by May 2024.

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

This document supersedes CEN/TS 16637-2:2014.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

The main changes compared to the previous edition are as follows:

- transfer of technical specification into a European Standard (see Clause 12 and Annex E);
- addition of requirements on the number of eluates (see 5.2);
- addition of requirements on the determination of the geometric surface area for test pieces thinner than 40 mm (see 8.3.3);
- addition of information on the determination of the geometric surface area for irregular test pieces (see Annex F);
- updating of normative and informative cross-references.

This document was elaborated on the basis of CEN/TS 15863 [2], which is based on NEN 7375 [3].

This document specifies a dynamic surface leaching test for determination of surface dependent release of substances from monolithic or plate-like or sheet-like construction products or granular construction products with low hydraulic conductivity under standardized conditions.

EN 16637, *Construction products: Assessment of release of dangerous substances*, is currently composed with the following parts:

- *Part 1: Guidance for the determination of leaching tests and additional testing steps;*
- *Part 2: Horizontal dynamic surface leaching test;*
- *Part 3: Horizontal up-flow percolation test.*

EN 16637-1 deals with the determination and use of test methods for leaching of construction products taking specific situations into account. EN 16637-3 specifies an up-flow percolation test to determine the leaching behaviour of granular construction products under standardized percolation conditions.

Background information on characterization of leaching behaviour of construction products can be found in Technical Reports provided by CEN/TC 351 (i.e. CEN/TR 16098 [4], CEN/TR 16496 [5]).

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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EN 16637-2:2023 (E)**Introduction**

The European Standards EN 16637-1, EN 16637-2 and EN 16637-3 are developed to assess the release of regulated dangerous substances (RDS) from construction products into soil, surface water and groundwater in the framework of Mandate M/366. The horizontal test methods developed under the Mandate M/366 are intended to be used to show compliance with notified regulations. The tests cover the release of substances from construction products and in particular, those that are regulated in notified regulations in one or more EU Member States.

EN 16637-1 specifies how the CEN Technical Product Committees and EOTA experts should determine the appropriate leaching test for the determination of the release of RDS from a construction product into soil, surface water and groundwater. EN 16637-1 gives background information for CEN Technical Product Committees on the following aspects:

- a) description of the intended conditions of use of the construction product (e.g. above ground exposed to the precipitation, or shielded from direct infiltration, in surface or groundwater) with respect to the release of RDS into soil, surface water and groundwater;
- b) identification of main release mechanisms, and the appropriate leaching test for a given construction product.

EN 16637-2 specifies a horizontal test to assess surface dependent release from monolithic, plate-like or sheet-like construction products (tank test).

EN 16637-3 specifies a horizontal test to assess release from granular construction products.

The test methods can be used for both steps in the hierarchy [type testing (TT) and factory production control (FPC)] and form the reference tests for the intended uses and conditions specified in EN 16637-1. In this hierarchy of testing conditionally “indirect tests” can be used, but are not specified.

The release of substances upon contact with water results in a potential risk to the environment during the intended use of construction products. The intent of these tests is to identify the leaching behaviour of construction products and thereby allow assessments of the release of RDS from such products to soil, surface water and groundwater under intended conditions of use in relation to CE marking and assessment and verification of constancy of performance.

This document does not address impact assessment. However, since the test methods described in the document may be used in the context of impact assessments and regulation based on impact assessments, some guidance on this issue is provided in EN 16637-1:2023, Annex A (informative).

In addition to existing validation results, in 2011 CEN/TC 351 began an extensive research program on robustness validation of the existing tank leaching and percolation tests. This was carried out by a consortium of European experts on 20 construction products to unify differences from the protocols of the different CEN Members and to check the influence of testing conditions on the test result (e.g. temperature, flow rate, renewal scheme). The results [6] of the research program confirmed the robustness of the horizontal tests known from former works. Conclusions from the program have been implemented into the Technical Specifications for the test methods. The performance of the leaching tests regarding repeatability and reproducibility was deduced from a second validation step and respective data [7], [8] are included in this document and in EN 16637-3:2023.

1 Scope

This document specifies a dynamic surface leaching test (DSLTL) which is aimed at determining the release per unit surface area as a function of time of inorganic and/or non-volatile organic substances from a monolithic, plate- or sheet-like product, when it is put into contact with an aqueous solution (leachant). The test method is not suitable for substances that are volatile under ambient conditions.

This test is a parameter specific test focusing on identifying and specifying parameter specific properties tested under specified conditions. It is not aimed at simulating real situations. The application of results to specific intended conditions of use can be established by means of modelling (not included in this document).

The test method applies to more or less regularly shaped test portions consisting of monolithic test pieces with minimum dimensions of 40 mm in all directions [volume > 64 000 mm³ (64 cm³)]. It also applies to plate- or sheet-like products with surface areas of minimum 10 000 mm² (100 cm²) exposed to the leachant. Products designed to drain water (e.g. draining tiles, porous asphalt) and monolithic granular products according to EN 16637-1:2023, Table 1, are also tested by this test method. All products to be tested are assumed to maintain their integrity over a time frame relevant for the considered intended use.

The modification for granular construction products with low hydraulic conductivity (Annex A) applies for granular particles with so little drainage capacity between the grains that percolation in percolation tests and in practice is nearly impossible.

Metals, metallic coatings and organic coatings on metals are excluded from the scope of this document because the principles of this test (diffusion) are not obeyed by these products. Guidance on the need for testing of these products is under consideration.

For some coatings (e.g. some renders with organic binders according to EN 15824 [9]) in intermittent contact with water, physical and chemical properties might be changed in permanent contact with water. For these products, this document is not appropriate.

Guidance on the applicability of the test method to a given product is outlined in EN 16637-1.

NOTE 1 This test method is only applicable if the product is chemically stable and the matrix does not dissolve. For construction products that are possibly used in contact with water this is usually the case as construction products are then supposed to be dimensionally stable. If a product possibly wears substantially in its intended use, the test cannot provide proper information. If the product contains a substantial amount of water-soluble compounds, e.g. gypsum or anhydrite, the matrix could (partially) dissolve and lead to dimensional instability of the test piece. In this case, the test standard also cannot be used.

NOTE 2 It is not always possible to optimize test conditions simultaneously for inorganic and organic substances. Optimum test conditions can also vary between different groups of organic substances. Test requirements for organic substances are generally more stringent than those for inorganic substances. The test conditions suitable for measuring the release of organic substances will generally also be applicable to inorganic substances.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 15934, *Sludge, treated biowaste, soil and waste — Calculation of dry matter fraction after determination of dry residue or water content*

EN 16637-1, *Construction products: Assessment of release of dangerous substances — Part 1: Guidance for the determination of leaching tests and additional testing steps*

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EN 16687:2023, *Construction products: Assessment of release of dangerous substances — Terminology*

EN 17087, *Construction products: Assessment of release of dangerous substances — Preparation of test portions from the laboratory sample for testing of release and analysis of content*

EN 17195, *Construction products: Assessment of release of dangerous substances — Analysis of inorganic substances in eluates*

EN ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples (ISO 5667-3)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16687:2023 and the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp/>

3.1**eluate**

solution obtained from a leaching test

[SOURCE: EN 16687:2023, 3.3.2.8]

3.2**laboratory sample**

sample or sub-sample(s) sent to or received by the laboratory

Note 1 to entry: When the laboratory sample is further prepared by subdividing, cutting, sawing, coring, drying, grinding, mixing, curing or by combinations of these operations, the result is the test sample. When no preparation of the laboratory sample is required, the laboratory sample is the test sample. A test portion is removed from the test sample for the performance of the test or for analysis.

Note 2 to entry: The laboratory sample is the final sample from the point of view of sample collection but it is the initial sample from the point of view of the laboratory.

[SOURCE: IUPAC 2014, modified — abridged and specified]

3.3**leachant**

liquid that is brought into contact with the test portion in the leaching procedure

Note 1 to entry: Usually demineralized water is used as leachant for laboratory leaching tests.

[SOURCE: EN 16687:2023, 3.3.2.7]

3.4**leaching behaviour**

release and change with time in release from a solid product in contact with a leachant as a function of major release controlling factors

Note 1 to entry: Examples of such factors are pH, *L/S*, *L/A*, *temperature*.

[SOURCE: EN 16687:2023, 3.3.2.10]

3.5

release mechanism

physical-chemical processes that control the release of substances from a solid construction product into a leachant

Note 1 to entry: In the case of monolithic products, the main release mechanisms are diffusion of substances, dissolution of substances, initial surface wash-off of substances and/or dissolution of the matrix. In case of granular products, the main release mechanisms are washout and solubility. Additional factors like pH or DOC also have an influence on the mechanism of the release.

Note 2 to entry: The release mechanism for every substance can be determined using the results of the release test (tank leaching test). Determination of the release mechanism is relevant for modelling of the source term and so for determination of the effects on soil and water over a time period.

[SOURCE: EN 16687:2023, 3.3.2.18, modified — Note 2 to entry is limited to tank leaching test]

3.6

liquid to surface area ratio

L/A

ratio between the volume of liquid (L) which in a given step of the test is in contact with the exposed surface area (A) of the test portion

Note 1 to entry: L/A is expressed in l/m^2 .

[SOURCE: EN 16687:2023, 3.3.2.13]

3.7

monolithic product

product which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time in the considered intended conditions of use

Note 1 to entry: Monolithic products are usually tested by a dynamic surface leaching test.

[SOURCE: EN 16687:2023, 3.1.2.4]

3.8

plate-like product

product formed as a semi-rigid or rigid plate, which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time in the considered intended conditions of use

Note 1 to entry: Plate-like products are usually tested by a dynamic surface leaching test.

[SOURCE: EN 16687:2023, 3.1.2.5]

3.9

release

emission

<leaching> liberation of chemical substances (e.g. non-volatile organic compounds, heavy metals, salts) from a construction product into soil, surface water or ground water or into the leachant of a test facility

Note 1 to entry: Release to soil, surface and groundwater can be expressed in terms of area related release (tank leaching test, e.g. mg/m^2) or in terms of mass related release (percolation test, e.g. mg/kg).

Note 2 to entry: The terms “emission” and “release” have fundamentally the same meaning. However, it is often a tradition to use the term “emission” when describing liberation of chemical substances or radiation into air and to use the term “release” when describing the liberation of chemical substances into soil or water.

[SOURCE: EN 16687:2023, 3.3.2.16]

EN 16637-2:2023 (E)**3.10****release rate**

product specific rate describing the mass of a substance released from a product at a given time interval in a laboratory leaching test

Note 1 to entry: The release rate is expressed in (mg/m²)/d (tank leaching test) or in (mg/kg)/d (percolation test). The first, area related release rate is also called “flux”.

[SOURCE: EN 16687:2023, 3.3.2.19, modified — Note 2 to entry deleted]

3.11**leachant renewal scheme**

selection of time intervals after which the leachant is renewed

[SOURCE: EN 16687:2023, 3.3.2.11]

3.12**sample**

portion of material selected from a larger quantity of material

Note 1 to entry: The manner of selection of the sample is usually prescribed in a sampling plan.

Note 2 to entry: The term “sample” is often accompanied by a prefix (e.g. laboratory sample, test sample) specifying the type of sample and/or the specific step in the sampling process to which the obtained material relates.

[SOURCE: ISO 11074:2015 [22], 4.1.17, modified — “soil” deleted]

3.13**sheet-like product**

product formed as a flexible or semi-flexible sheet, which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time in the considered intended conditions of use

SIST EN 16637-2:2024

Note 1 to entry: Sheet-like products are usually tested by the dynamic surface leaching test. [7996/sist-en-16637-2-2024](https://standards.iteh.ai)

[SOURCE: EN 16687:2023, 3.1.2.6]

3.14**test piece**

single monolithic, plate- or sheet-like piece as part of the test portion

[SOURCE: EN 16687:2023, 3.2.2.5]

3.15**test portion**

analytical portion

amount of the test sample taken for testing/analysis purposes, usually of known dimension, mass or volume

Note 1 to entry: The test portion might consist of more than one test piece.

[SOURCE: EN 16687:2023, 3.2.2.3, modified — Note 1 to entry and Note 2 to entry deleted, new Note 1 to entry added]

3.16**test sample**

analytical sample

sample, prepared from the laboratory sample, from which test portions are removed for testing or for analysis

[SOURCE: IUPAC 2014]

3.17**exposed surface**

A

<test leaching test> part of the total surface of the test portion exposed to the leachant

[SOURCE: EN 16687:2023, 3.3.2.12]

3.18**compacted granular product**

granular product with a low permeability, due to very small pores between the particles

Note 1 to entry: Compacted granular products are usually tested by a test method for granular construction products with low hydraulic conductivity, because the percolation test is not applicable due to the low permeability of the products.

[SOURCE: EN 16687:2023, 3.1.2.2]

3.19**monolithic granular product**

granular product with specific requirements on the grain size distribution to be tested in the dynamic surface leaching test (DSLTL)

[SOURCE: EN 16687:2023, 3.1.2.3]

3.20**test method for granular construction products with low hydraulic conductivity**

GLHC

release test method in which a granular construction product with low hydraulic conductivity is exposed with one defined surface to a leachant renewed at subsequent time intervals

[SOURCE: EN 16687:2023, 3.3.2.4]

3.21**dynamic surface leaching test**

DSLTL

release test method in which a monolithic, sheet-like or plate-like product is immersed in a leachant renewed at subsequent time intervals

[SOURCE: EN 16687:2023, 3.3.2.3, modified — Note 1 to entry deleted]

EN 16637-2:2023 (E)**3.22****limit of quantification****LOQ**

lowest value of an analyte (determinant) that can be determined with an acceptable level of accuracy and precision, generally determined as three times the limit of detection of the method

Note 1 to entry The LOQ is the lowest concentration of an analyte that can be quantified within defined limits of certainty after replicate measurements. As a “rule of thumb”, this is usually taken as three times the limit of detection of the analytical method.

[SOURCE: EN 16687:2023, 3.3.1.14, modified — Note 1 to entry added]

3.23**method detection limit****MDL**

lowest analyte concentration that can be detected with a specified analytical method including sample preparation with a defined statistical probability

[SOURCE: EN 16687:2023, 3.3.1.12, modified — Note 1 to entry deleted]

4 Symbols and abbreviations**4.1 Symbols**

For the purposes of this document, the following symbols apply.

A	geometric area of the test portion exposed surface of test piece(s), in m^2
c_i	concentration of the substance in eluate i , in $\mu g/l$
L	volume of liquid in contact with the test portion, in l
m_a	loss of weight, in g/m^2
m_s	mass of the solid matter that has fallen off during the test, in g
R_n	cumulative area release of the substance for period n including fraction $i = 1$ to n , in mg/m^2
r_i	area release of the substance in fraction i , in mg/m^2
P	test piece
V_p	volume of the test portion, in l
V_l	volume of the leachant, in l

4.2 Abbreviations

For the purposes of this document, the following abbreviations apply:

DL	detection limit
DOC	dissolved organic carbon
DSL T	dynamic surface leaching test
GLHC	test for granular construction products with low hydraulic conductivity
FEP	fluorinated ethylene propylene