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

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Teil 1: Leitfaden für die Festlegung von Auslaugprüfungen und zusätzlichen Prüfschritten

Produits de construction - Evaluation de l'émission de substances dangereuses - Partie 1: Guide pour la spécification des essais de lixivation et des étapes supplémentaires d'essai

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

Produits de construction - Evaluation de l'émission de substances dangereuses - Partie 1: Guide pour la spécification des essais de lixivation et des étapes supplémentaires d'essai Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Teil 1: Leitfaden für die Festlegung von Auslaugprüfungen und zusätzlichen Prüfschritten

This Technical Specification (CEN/TS) was approved by CEN on 25 February 2014 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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Foreword

This document (CEN/TS 16637-1:2014) 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.

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This Technical Specification deals with the determination and use of test methods for leaching of construction products taking specific situations into account. It specifies preconditions under which leaching tests for monolithic products and for granular products need to be selected.

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 [1], and CEN/TR 16496 [2]).

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

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Introduction

This informative introduction describes the interactions and interrelations between the release tests developed to assess the release of dangerous substances from construction products into soil, surface water and groundwater in the framework of the 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.

CEN/TS 16637-1 specifies how the CEN Technical Product Committees and EOTA experts are to determine the appropriate leaching test for the determination of the release of Regulated Dangerous Substances from a construction product into soil, surface water and groundwater.

CEN/TS 16637-2 describes a horizontal test to assess surface dependent release from monolithic, plate-like or sheet-like construction products while FprCEN/TS 16637-3 (in preparation) will describe a horizontal test to assess release from granular construction products. The test methods can be used for both steps in the hierarchy (type testing and factory production control) and are supposed to be used as the reference test for the intended uses and conditions specified in CEN/TS 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 Regulated Dangerous Substances 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.

Technical Product Committees are expected to apply the test standards developed in CEN/TC 351 for their products in order to test the potential release of Regulated Dangerous Substances to soil, surface water and groundwater. CEN/TS 16637-1 is intended to provide clear procedures to determine which test method is appropriate for a given product. CEN/TS 16637-1 aims to provide the information, needed in a CEN Technical Product Committee, on how to deal with the relevant test method(s) to enable the producer to declare a performance in the CE marking as a result of the test. CEN Technical Product Committees are referred to the informative Annex A and Annex B of CEN/TS 16637-1 and to CEN/TR 16098 [1], for background information on the following aspects:

- a) identification of the products addressed in the product standards which have relevance with respect to the release of dangerous substances into soil, surface water and groundwater (products only applied in the interior of buildings are not subject to testing for these properties);
- b) 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) in respect to the release of dangerous substances into soil, surface water and groundwater;
- c) identification of main release mechanisms.

Impact assessment is not part of the work of CEN/TC 351.

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, etc. [3]). The results 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. However, the performance of the leaching test regarding repeatability and reproducibility is dependent on the tested construction product and on the testing conditions. When these Technical Specifications of the horizontal leaching tests are adopted by CEN, the leaching tests referred to in

these Technical Specifications will not yet be fully validated. No data will be available on repeatability and reproducibility for the range of construction products. For other, sometimes comparable, matrices performance data are available from national as well as EU validation studies.

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1 Scope

(1) This Technical Specification allows the identification of the appropriate leaching test method for the determination of the release of Regulated Dangerous Substances from construction products into soil, surface water and groundwater. This document provides a stepwise procedure for the determination of appropriate release tests, including:

- a) guidance for the identification of construction products potentially emitting Regulated Dangerous Substances;
- b) determination of the test method based on general product properties;
- c) choice of the test method using specific product properties.

(2) Furthermore, this Technical Specification gives general guidance for CEN Technical Product Committees on basic aspects (sampling, sample preparation and storage, eluate treatment, analysis of eluates and documentation) to be specified in the relevant product standards.

(3) Metallic products, coatings on metallic products and organic coatings for metals are not considered in the determination scheme of this Technical Specification since the test method in CEN/TS 16637-2 (tank test) is not appropriate for the testing of these construction products due to a different release mechanism (solubility control).

NOTE Metallic products are excluded from the scope of CEN/TS 16637-2 because the principles of that test (diffusion) are not obeyed by these products. Metallic products have shown pH dependent solubility control, which means that metals released from the oxidation layer on the metal until the maximum possible solubility level at the prevailing pH conditions in the surrounding water is reached (more water in contact with the same metal surface means more metals released and more time does not lead to more release due to solubility control). Maximum level of release can often be reached in minutes to hours. More generally, it can be stated that expression of results for metallic surfaces in mg/(m2·s) is always "conditional", i.e. dependent on the local conditions at which the measurements were done, such as the volume of water relative to the surface area. For impact assessment, it is necessary to understand the above mentioned effects and to capture these effects in a test reflecting the dominant release mechanism. However, such a test method is currently unavailable. If the intrinsic leaching behaviour is known, release under specified local conditions could be determined by modelling. Furthermore, no notified regulations exist for metallic products at the time these Technical Specifications have been published.

(4) It is assumed that intermittent contact with water (e.g. exposure to rainwater) is tested - by convention - as permanent contact. For some coatings, (e.g. some renders with organic binders according to EN 15824) in intermittent contact to water, physical and chemical properties might be altered in permanent contact with water. These products are not considered in the determination scheme of this Technical Specification since the test method in CEN/TS 16637-2 is not appropriate for the testing of these construction products.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TS 16637-2:2014, Construction products — Assessment of release of dangerous substances — Part 2: Horizontal dynamic surface leaching test

3 Terms and definitions

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

3.1 Sampling and products

3.1.1

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 method for granular construction products with low hydraulic conductivity, because the percolation test is not applicable due to the low permeability of the products.

3.1.2

composite sample average sample aggregated sample sample that consists of two or more increments, put together in appropriate portions, from which the mean value of a desired characteristic may be obtained

[SOURCE: ISO 11074:2005 [4], 4.3.3, modified – editorial amendments]

3.1.3

curing

hardening of freshly prepared mixtures under well-defined conditions (time, temperature, humidity, etc.) specified in harmonized product standards

3.1.4

curing time

(minimal) time defined as necessary for curing before a release test can be executed to perform relevant test results (standards.iteh.ai)

3.1.5

granular product

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product composed of solid particles with a particle size smaller than a specified size or grading

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Note 1 to entry: Granular products are usually tested by a percolation test. A Technical Specification on the percolation test is under preparation.

3.1.6

increment

individual portion of product collected by a single operation of a sampling device which will not be tested as a single entity, but will be mixed with other increments in a composite sample

[SOURCE: ISO 11074:2005 [4], 4.1.8, modified – editorial amendments]

3.1.7

laboratory sample

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

[SOURCE: IUPAC 1990 [5], 2.5.5]

Note 1 to entry: When the laboratory sample is further prepared by subdividing, cutting, sawing, coring, mixing, drying, grinding, 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/analysis or for the preparation of a test specimen.

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.

3.1.8

monolithic granular product

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

3.1.9

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.

3.1.10

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.

3.1.11

population

<sampling> totality of items under consideration

[SOURCE: ISO 11074:2005, [4], 4.1.11, modified – without note, editorial amendments

Note 1 to entry:

See also the term "sub-population". (standards.iteh.ai)

3.1.12

sample <u>SIST-TS CEN/TS 16637-1:2014</u> portion of material selected from a larger guantity of material 253c5-0639-4b1b-aec0-

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[SOURCE: IUPAC 1990 [5], 2.1.1]

Note 1 to entry: The manner of selection of the sample should be prescribed in a sampling plan (3.1.13).

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.

3.1.13

sampling plan

predetermined procedure for the selection, withdrawal, preservation and transportation of product samples

3.1.14

scale

minimum quantity (mass or volume) of the product for which test results are obtained

Note 1 to entry: Information on characteristics of the product, including emission and variations therein, for a quantity of product smaller than the defined scale, is judged to be unimportant.

[SOURCE: CEN/TR 16220:2011 [6], Annex A, 3]

3.1.15

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

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

3.1.16

sub-population

<sampling> defined part of the population that is targeted for the purposes of sampling

[SOURCE: ISO 11074:2005, [4], 4.1.29, modified - specified]

Note 1 to entry: See also the term "population".

EXAMPLE Consider a continuous production process that results in a specific product. The population for that product is all the individual products produced between the moment the production process started (this may be years ago) and the moment the production process ends (this may be years ahead). From the perspective of testing, this definition does not provide a practical concept. Products produced in the past are no longer available for testing, while products that might be produced in the (far) future are neither available. The term "sub-population" provides a workable alternative, as the "start" and "end" of the sub-population can be defined in a practical way. For the same product, already in production for a number of years, the sub-population might be the production of a year, the production of a month, or what other definition is practical.

3.1.17

test portion

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

[SOURCE: IUPAC 1990 [5], 2.5.7]

EXAMPLE A bag of aggregates is delivered to the laboratory (the laboratory sample). For test purposes a certain amount of the aggregate is dried, the result is the test sample. Afterwards the column for a percolation test is filled with a test portion of dried aggregate.

3.1.18

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sample, prepared from the laboratory sample from which test portions are removed for testing or for analysis <u>SIST-TS CEN/TS 16637-1:2014</u>

[SOURCE: IUPAC:1990 [5], 2:5:6]standards.iteh.ai/catalog/standards/sist/e5f253c5-0639-4b1b-aec0-489aab819908/sist-ts-cen-ts-16637-1-2014

3.1.19

test specimen

test portion specially prepared for release testing in a test facility in order to simulate the releasebehaviour of the product under intended conditions of use

EXAMPLE Cement is used in construction as ingredient for concrete. For testing purposes, a test specimen of concrete is prepared for the release test, using a test portion of cement and adding additional ingredients (like aggregates) with a well-known leaching behaviour.

3.2 Release and laboratory testing

3.2.1

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

3.2.2

digestion

mineralization of the organic matter of a sample and dissolving of its mineral part (as completely as possible) when reacted with a reagent mixture

Note 1 to entry: Usually done with a strong, concentrated acid like aqua regia or nitric acid to dissolve inorganic substances for chemical analysis.

[SOURCE: CEN/TR 16045:2010 [4], 2.2.2]

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3.2.3 dynamic surface leaching test

DSLT

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

Note 1 to entry: See also the term "tank leaching test".

3.2.4

eluate

solution recovered from a leaching test

Note 1 to entry: See also the term "leachate".

[SOURCE: EN 12457-1:2002 [8], 3.3]

3.2.5

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.

3.2.6

extraction

dissolution of substances in a solvent for subsequent chemical analysis

Note 1 to entry: Usually done with an organic solvent to extract organic substances for chemical analysis or for special analysis of inorganic substances. (Standards.iten.al)

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[SOURCE: CEN/TR 16045:2010 [7], 2:2:5]TS CEN/TS 16637-1:2014

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impact assessment

model calculation with the purpose to assess the concentrations of Regulated Dangerous Substances at the point(s) of compliance

Note 1 to entry: Impact assessment use the release test results (the source term) to calculate the environmental concentration values of the substances at the point(s) of compliance by modelling the environmental transport for specified intended uses and for specified intended conditions of use. The final step is the comparison of the predicted environmental concentrations with the environmental limit values at the point(s) of compliance (impact evaluation).

Note 2 to entry: Impact assessment is not part of the standardization work in CEN/TC 351. The regulator is responsible for the definition of relevant intended conditions of use, the modelling of the environmental transport, the point of compliance and the limit values at the point of compliance.

3.2.8

impact evaluation

comparison of (predicted) environmental concentrations of substances to regulatory limit values in soil, surface water or groundwater at a point of compliance as a result of release from construction products

Note 1 to entry: Such predictions are made based on the results of release tests which are translated to intended conditions of use by modelling the source term and the environmental transport.

Note 2 to entry: The translation of test results to environmental concentrations is not part of standardization work in CEN/TC 351.

3.2.9

intended use

intended use of the construction product as defined in the applicable harmonized Technical Specification