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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 lixiviation 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

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This Technical Specification (CEN/TS) was approved by CEN on 13 May 2018 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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (CEN/TS 16637-1:2018) 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 shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 16637-1:2014.

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 organisations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This informative introduction describes the interactions and interrelations between the release tests 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.

CEN/TS 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.

CEN/TS 16637-2 describes a horizontal test to assess surface dependent release from monolithic, plate-like or sheet-like construction products while CEN/TS 16637-3 describes 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 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 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.

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 RDS to soil, surface water and groundwater. FprCEN/TS 16637-1 is intended to provide clear procedures to determine which test method is appropriate for a given product. CEN Technical Product Committees are referred to the informative Annex A and Annex B of this document and to CEN/TR 16098 [1], for background information 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.

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 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 [3]. 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 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.

1 Scope

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

a) determination of the test method based on general product properties;

b) choice of the test method using specific product properties.

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

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

NOTE See Annex F.

(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 [4]) 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 (in this case EN 16105 [5] might be an alternative method).

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.

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

CEN/TS 16637-3:2016, *Construction products - Assessment of release of dangerous substances - Part 3: Horizontal up-flow percolation test*

EN 16687, *Construction products - Assessment of release of dangerous substances - Terminology*

3 Terms and definitions

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

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

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

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 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 16687:2015, 2.2.2]

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: EN 16687:2015, 3.1.1]

3.1.3
curing
hardening of freshly prepared mixtures under well-defined conditions (time, temperature, humidity, etc.) specified in harmonised product standards

[SOURCE: EN 16687:2015, 3.2.6]

3.1.4
curing time
(minimal) time defined as necessary for curing before a release/emission test can be executed to obtain relevant test results

[SOURCE: EN 16687:2015, 3.2.7]

3.1.5
granular product
product composed of solid particles with a particle size smaller than a specified size or grading

Note 1 to entry: Granular products are usually tested by a percolation test.

[SOURCE: EN 16687:2015, 2.2.1]

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: EN 16687:2015, 3.1.2]

3.1.7
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, mixing, drying, grinding, and 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.

[SOURCE: EN 16687:2015, 3.2.1]

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)

[SOURCE: EN 16687:2015, 2.2.3]

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 intended conditions of use

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

[SOURCE: EN 16687:2015, 2.2.4]

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 intended conditions of use

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

[SOURCE: EN 16687:2015, 2.2.5]

3.1.11
population
totality of items under consideration

Note 1 to entry: See also the term “sub-population”.

[SOURCE: EN 16687:2015, 3.1.3]

3.1.12
sample
portion of material selected from a larger quantity of material

Note 1 to entry: The manner of selection of the sample should be described 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: EN 16687:2015, 3.1.5]

3.1.13
sampling plan
predetermined procedure for the selection, withdrawal, on-site pre-treatment, preservation and transportation of samples to be removed from a population

[SOURCE: EN 16687:2015, 3.1.6]

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: EN 16687:2015, 3.1.7]

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 intended conditions of use

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

[SOURCE: EN 16687:2015, 2.2.6]

3.1.16
sub-population
defined part of the population that is targeted for the purposes of sampling

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 also not 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 for a year, the production for a month, or another definition that is practical.

[SOURCE: EN 16687:2015, 3.1.8]

3.1.17
test portion
analytical portion
amount of the test sample taken directly for testing/analysis purposes, usually of known weight or volume

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.

[SOURCE: EN 16687:2015, 3.2.3]

3.1.18
test sample
sample, prepared from the laboratory sample from which test portions are removed for testing or for analysis

[SOURCE: EN 16687:2015, 3.2.2]

3.1.19
test specimen
test portion specially prepared for emission/release/radiation testing in a test facility in order to simulate the emission/release/radiation behaviour of the product under intended conditions of use

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

[SOURCE: EN 16687:2015, 3.2.4]

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

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

[SOURCE: EN 16687:2015, 4.2.3]

3.2.2
digestion
mineralization of the organic matter of a sample and dissolution of its mineral part (as completely as possible) when reacted with a reagent mixture

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

[SOURCE: EN 16687:2015, 3.2.9]

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 determined time intervals

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

[SOURCE: EN 16687:2015, 4.2.2]

3.2.4
eluate
solution obtained from a leaching test

Note 1 to entry: See also the term ”leachant”.

[SOURCE: EN 16687:2015, 4.2.7]

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.

[SOURCE: EN 16687:2015, 4.2.6]

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.

[SOURCE: EN 16687:2015, 3.2.11]

3.2.7
impact assessment
general term for the entire process of assessing the concentrations of regulated dangerous substances or parameters, at the point of compliance based on the leaching test results, the source term, (or, where applicable, the façade emission function) and the modelling of environmental transport taking into account the intended conditions of use

Note 1 to entry: The final step after the impact assessment is the comparison of the predicted environmental concentrations with the environmental limit values at the point(s) of compliance, see “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, modelling of the environmental transport, the point of compliance and the limit values at the point of compliance.

[SOURCE: EN 16687:2015, 4.2.21]

3.2.8
impact evaluation
assessment of immissions
comparison of (predicted) environmental concentrations of substances/parameters with regulatory limit values (or other assessment criteria) 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 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 standardisation work in CEN/TC 351.

[SOURCE: EN 16687:2015, 4.2.20]

3.2.9
intended use
intended use of the construction product as defined in the applicable harmonised Technical Specification

3.2.10
intended conditions of use
conditions that a product may undergo during service life and that influence its release/emission behaviour

Note 1 to entry: These conditions are expressed in parameters such as temperature, amount of water during exposure, wetting/drying; intended conditions of use may vary for instance as a function of time, location, orientation, geographical location, etc. For simplification, intended conditions of use are transferred into release scenarios for test purposes.

[SOURCE: EN 16687:2015, 4.1.16]

3.2.11
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: Such factors are diffusion, pH, L/S-ratio or time.

[SOURCE: EN 16687:2015, 4.2.9]

3.2.12
modelling of environmental transport
modelling of environmental path
transport term
modelling of immissions
theoretical estimation of the transport of substances in the environment under specific intended conditions of use based on test results or the source term for release of these substances

[SOURCE: EN 16687:2015, 4.2.22]

3.2.13
percolation test
PT
column test
release test method to determine the release of substances from a granular construction product packed in a column with a leachant percolating through it

[SOURCE: EN 16687:2015, 4.2.4]

3.2.14
point of compliance
POC
point in an environmental medium where substance concentrations/parameters should comply with regulatory limit values for soil, groundwater and/or surface water at a certain distance from the source

[SOURCE: EN 16687:2015, 4.2.25]

3.2.15
regulated dangerous substances
RDS
in the context of the CPR dangerous/hazardous substances, ions and radioactive substances that may present a danger for man or the environment during normal use of construction products when installed in works and for which at least one European Member State has notified a law, regulation or administrative provision or the European Union has a Community provision

[SOURCE: EN 16687:2015, 2.1.6]

3.2.16
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 groundwater or into the leachant of a test facility

Note 1 to entry: Release to soil, surface water and groundwater may 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 16687:2015, 4.2.15]

3.2.17
release mechanism
physico-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 for substances 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: Under appropriate conditions the release mechanism of every substance can be determined using the results of the release test (tank leaching test, percolation 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 16687:2015, 4.2.17]

3.2.18
release scenario (related to test method)
emission scenario (related to test method)
<leaching> model description of the release from construction products into their immediate soil and water environments and of the chemical, physical and geometrical parameters that influence this release and which forms the basis for defining the test methods as a function of the products and its intended use

Note 1 to entry: For soil, groundwater and surface water, three release scenarios have been defined for impermeable, low permeable and permeable construction products. Release scenario should not be confused with modelling of environmental transport.

[SOURCE: EN 16687:2015, 4.2.19]

3.2.19
source term
calculated, long term release or release function of a substance from a product related to intended conditions of use, which is used for modelling of environmental transport

[SOURCE: EN 16687:2015, 4.2.23]