
Gradbeni proizvodi - Ocenjevanje sproščanja nevarnih snovi - Določevanje ekotoksičnosti izlužkov gradbenih proizvodov

Construction products - Assessment of release of dangerous substances - Determination of ecotoxicity of construction product eluates

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Bestimmung der Ökotoxizität von Eluaten aus Bauprodukten

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**Construction products - Assessment of release of
dangerous substances - Determination of ecotoxicity of
construction product eluates**

Bauprodukte - Bewertung der Freisetzung von
gefährlichen Stoffen - Bestimmung der Ökotoxizität
von Eluaten aus Bauprodukten

This draft Technical Specification is submitted to CEN members for Vote. It has been drawn up by the Technical Committee CEN/TC 351.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents	Page
European foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Abbreviations	8
5 Leaching procedures for ecotoxicological testing.....	8
5.1 Suitable leaching tests and selection of fractions from leaching tests	8
5.1.1 General.....	8
5.1.2 Dynamic Surface Leaching Test (DSLTT) CEN/TS 16637-2	9
5.1.3 Horizontal up-flow percolation test (CEN/TS 16637-3)	9
5.1.4 Alternative leaching tests.....	9
5.2 Sampling, transport and storage of eluates.....	9
5.3 Pre-treatment of eluates.....	10
6 Aquatic ecotoxicological testing.....	11
6.1 Purpose of aquatic ecotoxicity testing.....	11
6.2 Selection of ecotoxicity tests and minimum test battery	11
6.3 Testing strategy and conditions	12
6.4 Limitations of aquatic ecotoxicity tests	13
7 Assessment of biodegradability.....	13
8 Test report and quality assurance procedure	14
Annex A (informative) Results from a European round robin test “Ecotoxicological characterisation of eluates from construction products”	15
Annex B (informative) Evaluation of test results.....	19
Bibliography.....	21

European foreword

This document (FprCEN/TS 17459:2019) 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 document is currently submitted to the Vote on TS.

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

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Introduction

The regulatory and technical background for this FprCEN/TS 17459 is explained in CEN/TR 17105 [1]. General information on ecotoxicity assessment is also provided there. This Technical Specification describes the assessment of ecotoxicological properties of eluates of construction products received from horizontal leaching tests harmonized by CEN/TC 351.

Aquatic ecotoxicity tests can be applied to eluates of construction products which come into contact with soil or water in their intended use as described in 3.2.2.2 *Products relevant for soil, surface water or groundwater* of CEN/TR 16098:2010 [2] and in CEN/TS 16637-1. The test procedure specified in this document covers construction products that fall under the scope of the leaching tests in the CEN/TS 16637 series and have an organic content of > 50 % by mass. For the covered products adequate validation data has been provided (see Annex A).

This document is recommended to Technical Committees for construction products (product TCs), if they have been mandated to address ecotoxicity in their product standards or if they are interested to include ecotoxicity in a dossier prepared in the context of qualifications for a “without testing” status. This document is also recommended to EOTA in case there is a wish to include ecotoxicity testing in European Assessment Documents.

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1 Scope

This document specifies a test procedure that combines horizontal leaching tests with ecotoxicity tests for the assessment of eluates of construction products.

The test procedure in this document is established for construction products with an organic content of > 50 % by mass. Mineral-based construction products are covered in the following case: 1) the liquid or pasty product hardens in direct contact with soil or groundwater and 2) the used binder contains > 50 % organics by mass. For the covered products adequate validation data have been provided (see Annex A).

This document is not applicable for the assessment of terrestrial ecotoxicity of construction products.

NOTE Terrestrial ecotoxicity tests for construction products are described in CEN/TR 17105.

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 1484, *Water analysis — Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)*

EN 12457-1, *Characterisation of waste — Leaching — Compliance test for leaching of granular waste materials and sludges — Part 1: One stage batch test at a liquid to solid ratio of 2 l/kg for materials with high solid content and with particle size below 4 mm (without or with size reduction)*

EN ISO 5667-16:2017, *Water quality — Sampling — Part 16: Guidance on biotesting of samples (ISO 5667-16:2017)*

<https://standards.iteh.ai/catalog/standards/sist/c3c21ab8-5b94-4956-b467-4d07e9e11524/test-of-toxicity-of-extract-17459-2020>

EN ISO 6341, *Water quality — Determination of the inhibition of the mobility of Daphnia magna Straus (Cladocera, Crustacea) — Acute toxicity test (ISO 6341)*

EN ISO 8692, *Water quality — Fresh water algal growth inhibition test with unicellular green algae (ISO 8692)*

EN ISO 9408, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium by determination of oxygen demand in a closed respirometer (ISO 9408)*

EN ISO 9439, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Carbon dioxide evolution test (ISO 9439)*

EN ISO 11348-1, *Water quality — Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test) — Part 1: Method using freshly prepared bacteria (ISO 11348-1:2007)*

EN ISO 15088:2008, *Water quality — Determination of the acute toxicity of waste water to zebrafish eggs (Danio rerio) (ISO 15088:2007)*

EN ISO 20079:2006, *Water quality — Determination of the toxic effect of water constituents and waste water on duckweed (Lemna minor) — Duckweed growth inhibition test (ISO 20079:2005)*

ISO 11350, *Water quality — Determination of the genotoxicity of water and waste water — Salmonella/microsome fluctuation test (Ames fluctuation test)*

FprCEN/TS 17459:2019 (E)

ISO 13829, *Water quality — Determination of the genotoxicity of water and waste water using the umu-test*

CEN/TS 16637-1:2018, *Construction products: Assessment of release of dangerous substances — Part 1: Guidance for the determination of leaching tests and additional testing steps*

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

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

3 Terms and definitions

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

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

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

3.1**bioassay**

technique for evaluating the biological effect, either qualitatively or quantitatively, of various substances in water by means of changes in a specified biological activity

Note 1 to entry: Bioassay is a broader term than ecotoxicity test and covers also for instance biodegradability tests.

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[SOURCE: ISO 6107-8:1993/Amd 1:2001 [3], no number]

3.2**biodegradation**

mineralization of organic compounds by bacteria and fungi to carbon dioxide, water and inorganic compounds

3.3**control**

mixture of control medium and organisms used in the test without test sample

3.4**control medium**

combination of dilution water and/or nutrient medium used in the test

[SOURCE: EN ISO 20079:2005, 3.6]

3.5**dilution level****D**

reciprocal value of the volume fraction of test sample in dilution water in which the test is conducted

EXAMPLE 250 ml of test sample in a total volume of 1 000 ml (volume fraction of 25 %) represents dilution level $D = 4$.

[SOURCE: EN ISO 15088:2008, 3.2, modified - “waste water” replaced by “test sample”]

3.6

dilution water

water added to the test sample to prepare a series of defined dilutions

Note 1 to entry: The composition of the water is specified in the specific test.

[SOURCE: EN ISO 20079:2006, 3.7]

3.7

ecotoxicity test

method for determining potential adverse effects to biological systems which a sample has an inherent capacity to cause

3.8

effective concentration

EC_x

concentration of the test sample at which an effect of x % is measured, if compared to the control

[SOURCE: ISO 20227:2017 [4], 3.1]

3.9

eluate

aqueous solution recovered from a leaching test

[SOURCE: CEN/TR 16110:2010 [5], 3.2]

3.10

leaching test

laboratory test during which a construction product is put into contact with a leachant under strictly defined conditions for the determination of the release of substances into water

3.11

lowest ineffective dilution

dilution factor

LID

lowest ineffective dilution tested, expressed as dilution level *D* (3.5), at which no inhibition, or only effects not exceeding the test-specific variability, are observed

[SOURCE: EN ISO 15088:2008, 3.5]

3.12

storage time

period of time between filling of the sample container and further treatment of the sample in the laboratory, if stored under predefined conditions

[SOURCE: EN ISO 5667-3:2018 [6], 3.4]

3.13

test material

material to be tested

[SOURCE: ISO 17126:2005 [7], 3.3]

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4 Abbreviations

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

CEN/TC	Technical Committee in CEN
CEN/TR	Technical Report adopted by CEN
CEN/TS	Technical Specification adopted by CEN
DOC	dissolved organic carbon
DSLIT	dynamic surface leaching test
EC	effective concentration
EOTA	European Organization for Technical Assessment
LID	lowest ineffective dilution
TOC	total organic carbon

5 Leaching procedures for ecotoxicological testing

5.1 Suitable leaching tests and selection of fractions from leaching tests

5.1.1 General

This Technical Specification is part of a modular horizontal approach and belongs to the analytical step (CEN/TS 16637-1:2018, Figure 2, number 6). This approach was adopted in CEN/TC 351. "Horizontal" means that the methods can be used for products with certain properties as described in CEN/TS 16637-1. "Modular" means that a test standard developed in this approach concerns a specific step in assessing a property and not the whole "chain of measurement" (from sampling to analyses). Differing from the modules for chemical analyses this Technical Specification also contains limited modifications to the leaching step (CEN/TS 16637-1:2018, Figure 2, number 5) as detailed below.

A leaching method shall be selected using guidance given in CEN/TS 16637-1. Eluates from the DSLIT according to CEN/TS 16637-2 and column test according to CEN/TS 16637-3 are suitable for ecotoxicity tests on the basis of current experience.

The selection of fractions from leaching tests for ecotoxicity tests depends on the purpose of the testing approach. Generally, for many construction products the maximum effect is expected to occur with the first elution steps. It is often also practicable to test the first two fractions, because organic substances are not always stable during long immersion periods.

An alternative option for the selection of fractions is to define an indicative parameter (e.g. TOC or substances of interest) which is analysed in each eluate fraction. The two fractions with the highest amount of the indicative parameter are combined and tested.

For construction products with continuously releasing compounds, those fractions with the longest contact time from an advanced stage of the leaching procedure can exhibit higher effects. By comparison of effects from different fractions, the longer term behaviour of the construction products can be assessed. The use of this option should be justified with an indicative parameter.

The results of ecotoxicity tests with the same product, but using a different leaching test are not comparable due to the different test conditions.

5.1.2 Dynamic Surface Leaching Test (DSLTT) CEN/TS 16637-2

CEN/TS 16637-2 describes a tank test for monolithic construction products of > 40 mm edge length in all directions and for plates or sheets with a surface area of > 100 cm² exposed to the eluate. In the standard procedure, this test is carried out for 64 days, while the eluate water is replaced at distinct time intervals (after 6 h, 24 h, 2,25 d, 4 d, 9 d, 16 d, 36 d and 64 d).

In order to generate suitable eluates for ecotoxicity testing the DSLTT shall be performed as follows:

- only the first two elution steps after 6 h and additional 18 h are carried out and both eluates are unified for ecotoxicity testing;
- the lower limit of the liquid / surface area relation (L/A), corresponding to 20 l/m² (2 ml/cm²), is applied in order to maximize the concentration level in the eluates (smallest liquid to surface area).

NOTE These adjustments have been applied in the European round robin test for the ecotoxicological characterization of construction products [8].

It is recommended to investigate eluates that represent other elution steps, if information on later stages of leaching processes is desired.

5.1.3 Horizontal up-flow percolation test (CEN/TS 16637-3)

The horizontal up-flow percolation test is a method to determine the leaching behaviour of non-volatile inorganic and organic substances from granular construction products (without or with size reduction). The construction products are subjected to percolation with water as a function of liquid to solid ratio under specified percolation conditions. The method is a once-through column leaching test.

Eluates from up-flow percolation tests according to CEN/TS 16637-3 shall be collected for ecotoxicity testing until an L/S ratio of 2 l/kg is reached. Mass of test material and dimension of the applied columns have to be adapted to obtain sufficient eluate volume for testing. Furthermore the relationship between maximum grain size and minimal column dimension as specified in CEN/TS 16637-3 has to be fulfilled.

It is recommended to investigate eluates that represent higher L/S ratios, if information on later stages of leaching processes is desired.

5.1.4 Alternative leaching tests

The conditions for using other leaching tests (indirect tests) are defined in CEN/TS 16637-1:2018, Clause 7. From the alternative methods referred to in CEN/TS 16637-1 especially EN 12457-1 and EN 16105 are known to generate suitable eluates for ecotoxicity tests on the basis of experience with construction products.

EN 12457-1 is a one stage batch test with a liquid to solid ratio of 2 l/kg for materials with high solid content and with particle size below 4 mm (without or with size reduction). Where CEN/TS 16637-3 is used as the reference method, EN 12457-1 shall be used for quality assurance where applicable.

Products that come into contact with water only occasionally in their intended use may not be stable in a test set up with long time immersion in water like foreseen in the reference method CEN/TS 16637-2. For these products a leaching test with short immersion phases according to EN 16105 is recommended instead. In this test the construction products are exposed to cycles of wetting and drying.

5.2 Sampling, transport and storage of eluates

The goal of sampling is to obtain a representative eluate and to supply it to the laboratory in the correct manner. The eluates may be susceptible to changes as a result of physical, chemical or biological reactions. The eluates should be preferably tested immediately after sampling to avoid changes in the original composition as a result of physical and chemical reactions and/or biological processes. If this is