

ICS 19.040; 13.040.20; 91.100.01

English Version

## Construction products - Assessment of release of dangerous substances - Part 3: Horizontal up-flow percolation test

Produits de construction - Evaluation de l'émission de substances dangereuses - Partie 3 : Essai horizontal de percolation à l'écoulement ascendant

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Teil 3: Horizontale Perkolationsprüfung im Aufwärtsstrom

This Technical Specification (CEN/TS) was approved by CEN on 15 March 2016 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.

CEN members are the national standards bodies of 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 United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

<b>Contents</b>	<b>Page</b>
European foreword.....	4
Introduction .....	5
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Symbols and abbreviations .....	10
4.1 Symbols.....	10
4.2 Abbreviations .....	11
5 Principle .....	11
6 Reagents .....	12
7 Equipment .....	12
8 Sample preparation.....	14
8.1 General.....	14
8.2 Preparation of the test sample.....	14
8.2.1 Principles .....	14
8.2.2 Rules of application.....	15
8.3 Test portion.....	16
8.4 Drying.....	16
8.5 Subsampling.....	16
8.6 Sieving of samples into fractions.....	16
8.7 Size reduction of particles .....	17
9 Test procedure .....	17
9.1 Temperature.....	17
9.2 Determination of dry residue .....	17
9.3 Pre-treatment of the column.....	17
9.4 Packing of the column .....	18
9.5 Start of the test.....	18
9.5.1 Equilibration.....	18
9.5.2 Calculation of the flow rate.....	18
9.6 Collection of eluates .....	18
9.7 Further preparation of the eluates for analysis.....	21
9.8 Blank test .....	21
10 Evaluation of measurement results .....	21
10.1 Expression of results in concentrations.....	21
10.2 Expression of results in terms of mass related release.....	22
11 Documentation and test report.....	22
12 Test performance.....	24
13 Indirect methods .....	24
13.1 Definition .....	24
13.2 Provisions .....	24

<b>13.3</b>	<b>Examples of “indirect” methods</b> .....	<b>24</b>
<b>Annex A</b>	<b>(informative) Examples for sample preparation procedure</b> .....	<b>25</b>
<b>A.1</b>	<b>General</b> .....	<b>25</b>
<b>A.2</b>	<b>Example 1</b> .....	<b>25</b>
<b>A.3</b>	<b>Example 2</b> .....	<b>26</b>
<b>Annex B</b>	<b>(informative) Illustration of the column and accompanying equipment</b> .....	<b>28</b>
<b>Annex C</b>	<b>(normative) Procedures for packing and saturation of the column</b> .....	<b>29</b>
<b>C.1</b>	<b>General</b> .....	<b>29</b>
<b>C.2</b>	<b>Column filling and packing</b> .....	<b>29</b>
<b>C.3</b>	<b>Procedure for packing</b> .....	<b>29</b>
<b>C.4</b>	<b>Water saturation</b> .....	<b>30</b>
<b>Annex D</b>	<b>(informative) Assessment of release mechanism(s)</b> .....	<b>32</b>
<b>D.1</b>	<b>Overview of release mechanisms</b> .....	<b>32</b>
<b>D.2</b>	<b>Overview of release mechanisms</b> .....	<b>33</b>
<b>D.3</b>	<b>Overview of release mechanisms</b> .....	<b>37</b>
<b>D.4</b>	<b>Examples</b> .....	<b>38</b>
	<b>Bibliography</b> .....	<b>54</b>

## European foreword

This document (CEN/TS 16637-3:2016) 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 December 2016 and conflicting national standards shall be withdrawn at the latest by December 2016.

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 was elaborated on the basis of CEN/TS 14405.

This Technical Specification specifies an up-flow percolation test to determine the leaching behaviour of granular construction products under standardized percolation conditions.

CEN/TS 16637-1 deals with the determination and use of test methods for leaching of construction products taking specific situations into account. CEN/TS 16637-2 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.

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 and CEN/TR 16496).

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, 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.

## Introduction

This introduction describes the interactions and interrelations between the three Technical Specifications CEN/TS 16637-1, CEN/TS 16637-2 and CEN/TS 16637-3 developed to assess the release of dangerous substances from construction products into soil, surface water and ground water 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 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 specified in CEN/TS 16637-2 and CEN/TS 16637-3 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. CEN/TS 16637-2 includes a procedure with a modified tank leaching test GLHC for testing granular products with a low hydraulic conductivity as determined by failure to achieve a sufficient water flow in the percolation test.

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 use conditions in relation to CE marking.

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 Annexes A and B of CEN/TS 16637-1 and to CEN/TR 16098 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 use conditions of the construction product (e.g. above ground exposed to the precipitation, or shielded from direct infiltration, in surface or ground water) 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 in different CEN-Member States and to check the influence of testing conditions on the test result (e.g.

temperature, flow rate, renewal scheme, particle size in the percolation test etc., see bibliography. 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 Technical Specification specifies an Up-flow Percolation Test (PT) which is applicable to determine the leaching behaviour of inorganic and non-volatile organic substances from granular construction products. The test is not suitable for substances that are volatile under ambient conditions. 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.

(2) This up-flow percolation test is performed under specified test conditions for construction products and does not necessarily produce results that mimic specific intended use conditions. This test method produces eluates, which can subsequently be characterized by physical, chemical and ecotoxicological methods according to existing standard methods. The results of eluate analysis are presented as a function of the liquid/solid ratio. The test results enable the distinction between different leaching behaviour.

NOTE 1 Volatile organic substances include the low molecular weight substances in mixtures such as mineral oil.

NOTE 2 It is not always possible to adjust test conditions simultaneously for inorganic and organic substances and test conditions may also vary between different groups of organic substances. Test conditions for organic substances are generally more stringent than those for inorganic substances. The test conditions are generally described in a way that they fit testing organic substances and are also applicable to inorganic substances depending on the set-up.

NOTE 3 For ecotoxicity testing, eluates representing the release of both inorganic and organic substances are needed. In this document, ecotoxicological testing is meant to include also genotoxicological testing.

Construction products that exhibit a saturated hydraulic conductivity of about  $10^{-8}$  m/s or higher can usually be subjected to this test. This procedure is also applicable to materials showing solidification in the column, if the final hydraulic conductivity is within the specified range. Inert granular material should not be added to improve permeability in order to enable their testing.

NOTE 4 This procedure is generally not applicable to products that are easily biologically degradable and products reacting with the leachant, leading, for example, to excessive gas emission or excessive heat release, impermeable hydraulically bound products or products that swell in contact with water.

## 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.

EN 933-1, *Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method*

EN 14346, *Characterization of waste - Calculation of dry matter by determination of dry residue or water content*

EN 16192, *Characterization of waste - Analysis of eluates*

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

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