



Institut luxembourgeois de la normalisation
de l'accréditation, de la sécurité et qualité
des produits et services

ILNAS-EN 17516:2023

Waste - Characterization of granular solids with potential for use as construction material - Compliance leaching test - Up-flow percolation test

Déchets - Caractérisation des solides
granulaires présentant un intérêt
potentiel comme matériaux de
construction - Essai de conformité par

Abfall - Charakterisierung von granularen
Feststoffen mit Verwertungspotential als
Ersatzbaustoff -
Übereinstimmungsuntersuchung des



National Foreword

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EUROPEAN STANDARD ILNAS-EN 17516:2023 **EN 17516**
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**Waste - Characterization of granular solids with potential
for use as construction material - Compliance leaching test
- Up-flow percolation test**

Déchets - Caractérisation des solides granulaires
présentant un intérêt potentiel comme matériaux de
construction - Essai de conformité par lixiviation -
Essai de percolation à écoulement ascendant

Abfall - Charakterisierung von granularen Feststoffen
mit Verwertungspotential als Ersatzbaustoff -
Übereinstimmungsuntersuchung des
Elutionsverhaltens - Perkulationsprüfung im
Aufwärtsstrom

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

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COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 17516:2023) has been prepared by Technical Committee CEN/TC 444 “Environmental characterization of solid matrices”, 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of an identical text or by endorsement, at the latest by May 2024 and conflicting national standards shall be withdrawn at the latest by May 2024.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 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.

This document specifies an up-flow percolation test to determine the compliance leaching status of granular solid waste with potential for beneficial use as construction product under standardized percolation conditions. The test is equal to the Horizontal up-flow percolation test for construction products (EN 16637-3), which in turn was elaborated based on the up-flow percolation test for characterization of waste (CEN/TS 14405:2004). Modifications have been implemented based on intensive robustness validation work on EN 16637-3 [4], [22]. The reason for implementing this percolation test is to provide a means to avoid double testing of waste-derived aggregates that could have a potential as construction products.

NOTE Waste legislation generally prescribes the use of EN 14405 to describe the leaching behaviour of inorganic and non-volatile organic substances from granular waste materials, whereas construction products legislation generally prescribes the use of EN 16637-3 to describe the leaching behaviour of inorganic and non-volatile organic substances from construction products, including waste materials with a potential as construction products.

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).

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.

Introduction

The implementation of a Circular Economy has a high priority on the agenda of the European Commission. To fulfil the needs of a Circular Economy granular solid waste should be used as construction product as much as possible, thus diminishing the amount of landfilling to a minimum and save natural resources.

The release of dangerous substances upon contact with water results in a potential risk to the environment during the intended utilization of waste materials as construction products. The intent of this document together with EN 14405 or the EN 12457 series is to identify the leaching behaviour of granular solid waste with potential for beneficial use as construction product and thereby allow assessments of the release of regulated dangerous substances to soil, surface water and groundwater under intended use conditions in relation to CE marking of construction products derived from waste.

This document describes an up-flow percolation test for granular solid waste with potential for beneficial use as a construction product. It has been elaborated to avoid double testing, i.e. to assess the compliance with both waste and construction products regulations in one run. This test addresses granular solid waste with existing knowledge on long-term leaching behaviour in waste management scenarios obtained i.e. using basic characterization test EN 14405. The specified methods under Clauses 5 to 12 (Principle, Reagents, Equipment, Sample preparation, Test procedure, Evaluation of measurement results, Documentation and Test Report as well as Test Performance) are identical to the corresponding clauses of EN 16637-3 (Horizontal up-flow percolation test) with the exception that the term “construction product” has been changed to terms relevant for this standard such as “granular solid waste with potential to be reused as construction product” or similar.

In the different European countries, tests have been developed to characterize and assess dangerous substances which can be leached from solid matrices (e.g. construction products, contaminated soils, solid waste materials). The intent of these tests is to identify the leaching behaviour of these materials. The complexity of the leaching process makes simplifications necessary. All relevant aspects of leaching behaviour cannot be addressed in one single standard. The test hierarchy for waste is e.g. described in EN 14405, while guidance of appropriate leaching test for determining leaching of dangerous substances from construction products is specified in EN 16637-1.

The test procedure described in this document constitutes a compliance test used to verify compliance to regulatory limit values. Column percolation tests according to EN 14405 is applied for basic characterization of granular solid waste. Column percolation tests according to EN 16637-3 is applied for basic characterization of construction products.

Basic characterization constitutes a full characterization of the waste by gathering all the necessary information for a safe management of the waste in the short and long term. Basic characterization may provide general information on the waste (i.e. type and origin, composition, consistency, leachability, etc.), information for understanding the behaviour of waste in the considered management scenario, comparison of waste properties against limit values, and detection of key variables (critical parameters as liquid/solid (L/S) ratios, leachant composition, factors controlling leachability such as pH, redox potential, complexing capacity and physical parameters) for compliance testing and options for simplification of compliance testing. Compliance testing is used to demonstrate that the sample of today fits the population of samples tested before by basic characterization and through that is used to carry out compliance with regulatory limit values. The compliance test should therefore always be part of the basic characterization program. The compliance test focuses on key variables and leaching behaviour identified by basic characterization tests. Parts of basic characterization tests can also be used for compliance purposes.

Informative Annex A (A-Deviation) is an integral part of this document.

1 Scope

This document specifies an up-flow percolation test (PT) which is applicable in compliance testing to determine the leaching behaviour of inorganic and non-volatile organic substances from granular solids with potential for use as construction material. The test is not suitable for substances that are volatile under ambient conditions. The granular solids 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.

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

This up-flow percolation test is performed under specified test conditions for granular solids with potential for use as construction material 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 2 It is not always possible to adjust test conditions simultaneously for inorganic and organic substances. Test conditions can 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.

NOTE 4 Granular solid waste materials with a low hydraulic conductivity that can cause detrimental pressure build-up are not supposed to be subjected to this test.

NOTE 5 This procedure is generally not applicable to solids that are easily biologically degradable and solids reacting with the leachant, leading to, for example, excessive gas emission or excessive heat release, impermeable hydraulically bound solids or solids that swell in contact with water.

Granular solid waste materials without potential for beneficial use are excluded from the scope.

NOTE 6 Granular solid waste materials without potential for beneficial use can be materials with gas generation or biodegradation during a potential reuse scenario.

This test is applicable to types of granular solid waste of which the general long-term leaching behaviour is known based on previous investigations.

In this document the same test conditions as for EN 16637-3 (CEN/TC 351/WG 1) are applied in order to allow full comparability of testing construction products and waste derived construction products to avoid double testing. The EN 16637-3 test results are eligible in the context of testing granular solids with potential for use as construction material as well.

NOTE 7 If a leaching test according to EN 16637-3 has been performed, additional EN 17516 testing does not need to be carried out.

NOTE 8 The relative standard deviations for inorganic and organic substances are relatively high which is due to low concentration levels in the eluates (see Annex F).

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/TR 15310 (all parts), *Characterization of waste — Sampling of waste materials*

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

EN 14405, *Characterization of waste — Leaching behaviour tests — Up-flow percolation test (under specified conditions)*

EN 15002, *Characterization of waste — Preparation of test portions from the laboratory sample*

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*

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

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 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, modified – Note 1 to entry deleted]

3.2

granular solid waste

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