

EHITUSTOOTED. OHTLIKE AINETE ERALDUMISE
HINDAMINE. RUUMIDE SISEÕHKU TOIMUVA
EMISSIONI MÄÄRAMINE

Construction products: Assessment of release of
dangerous substances - Determination of emissions into
indoor air

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16516:2017 sisaldab Euroopa standardi EN 16516:2017 ingliskeelset teksti.	This Estonian standard EVS-EN 16516:2017 consists of the English text of the European standard EN 16516:2017.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 04.10.2017.	Date of Availability of the European standard is 04.10.2017.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 13.040.20, 91.100.01

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

Construction products: Assessment of release of
dangerous substances - Determination of emissions into
indoor air

Produits de construction: Évaluation de l'émission de
substances dangereuses - Détermination des émissions
dans l'air intérieur

Bauprodukte: Bewertung der Freisetzung gefährlicher
Stoffe - Bestimmung der Emissionen in die
Innenraumluft

This European Standard was approved by CEN on 9 July 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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, Serbia, 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

Contents

Page

European foreword.....	5
Introduction	6
1 Scope.....	8
2 Normative references.....	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions	9
3.2 Abbreviations.....	15
4 Intended conditions of use, emission scenarios and European reference room.....	15
4.1 Intended conditions of use and emission scenario.....	15
4.2 Reference room and emission scenario.....	16
4.2.1 General.....	16
4.2.2 Dimensions and loading factors in the reference room.....	16
4.2.3 Ventilation in the reference room.....	17
4.2.4 Climate conditions in the reference room	17
4.3 Time schedule of emission(s) determination.....	17
5 Product sampling and transport to the laboratory	17
5.1 General.....	17
5.2 Objective of sampling	17
5.3 Preparation of a sampling plan and sampling strategy	17
5.3.1 General.....	17
5.3.2 Sampling approach.....	18
5.3.3 Population and sub-population	18
5.3.4 Scale	18
5.3.5 Size of samples, of increments when relevant, and sampling techniques.....	18
5.3.6 Sampling location and moment	19
5.4 Information from the testing laboratory needed to complement the product sampling plan	19
5.5 Packaging and transport of laboratory sample.....	19
5.6 Sample description, marking of laboratory samples and the sampling report.....	20
5.7 Chain of custody report.....	20
5.8 Dispatch of product samples, time schedule.....	20
6 Handling of product samples in the laboratory	21
6.1 Storage of sample in the testing laboratory	21
6.2 Preparation of the test specimen	21
7 Test chamber conditions	22
7.1 Principles	22
7.2 Dimensions of test specimen	22
7.3 Loading factor.....	22
7.4 Ventilation	23
7.5 Air velocity.....	23
7.6 Cleanliness of test chamber.....	23
7.7 Testing climate (temperature, relative humidity of supply air).....	23
7.8 Storage of test specimen	23
7.9 Large products or inhomogeneous products.....	24

7.10	Volume of test chamber.....	24
7.11	Placement of test specimen in test chamber	24
8	Determination of vapour-phase organic compounds in test chamber air.....	24
8.1	Common requirements.....	24
8.2	Determination of VOCs and SVOCs in test chamber air	26
8.2.1	General	26
8.2.2	Analytical system	26
8.2.3	Tube conditioning and laboratory blank tubes.....	29
8.2.4	Sampling test chamber air.....	29
8.2.5	Identification, calibration and analysis.....	30
8.2.6	Total volatile organic compounds (TVOC) and total semi-volatile organic compounds (TSVOC)	33
8.3	Determination of formaldehyde and some other volatile and very volatile carbonyl compounds in test chamber air	34
8.3.1	General	34
8.3.2	Analytical system.....	34
8.3.3	Sampling test chamber air.....	34
8.3.4	Blank tubes	34
8.3.5	Identification, calibration and analysis.....	35
8.4	Other general aspects of quality control.....	35
8.4.1	Laboratory quality checks.....	35
8.4.2	External references.....	35
9	Calculation of specific emission rates and expression of results at the reference room	36
10	Reporting for the horizontal reference method.....	39
10.1	General	39
10.2	Sampling	39
10.3	Handling of samples in the laboratory, preparation of test specimen.....	39
10.4	Test chamber conditions	39
10.5	Determination of vapour-phase organic compounds in test chamber air.....	39
10.6	Calculation and reporting of test results.....	40
11	Indirect methods.....	40
Annex A (informative)	Repeatability and reproducibility.....	42
A.1	Repeatability	42
A.2	Reproducibility.....	42
Annex B (informative)	Examples of indirect methods (also called simplified, screening, secondary, derived or alternative methods)	44
B.1	General	44
B.2	Indirect methods-emissions testing	44
B.2.1	Emission cell.....	44
B.2.2	Micro-chamber	44
B.2.3	Thermal extraction	45
B.3	Indirect methods specifying alternative procedures	45
B.3.1	Headspace and in-can VOC determination	45
B.3.2	VOC content determination	45
B.3.3	Formaldehyde specific methods Formaldehyde-specific testing methods are.....	45
B.4	Other secondary methods — Prediction of results at specified time	45
Annex C (informative)	Information on very volatile organic compound (VVOC) testing.....	46
Annex D (informative)	Example of a form for the sampling report	47

Annex E (informative) Example form for a chain of custody report..... 48

Annex F (informative) Benzene artefact generation on Tenax 49

Annex G (normative) List of non-carcinogenic VOCs..... 50

Annex H (informative) List of carcinogenic VOCs..... 58

Bibliography..... 60

European foreword

This document (EN 16516:2017) 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 April 2018, and conflicting national standards shall be withdrawn at the latest by April 2018.

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 16516:2013 .

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

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard was developed under the remit of Mandate M/366 'Development of horizontal standardized assessment methods for harmonised approaches relating to dangerous substances under the Construction Products Directive (CPD)', addressing the preparation of horizontal measurement/test methods for the determination of emission of regulated dangerous substances from construction products into indoor air, soil, surface water and ground water. This mandate is a complement to the product mandates granted by the European Commission to CEN under European law for construction products. The harmonized products standards (hEN) developed in CEN under mandates from the European Commission specify construction product(s) as put on the market and address their intended conditions of use. The text of Mandate M/366 is available at www.cen351.org.

Details of relevant European or national regulations are available in the "TRIS database" [1].

This European Standard has gone through a robustness validation for identifying how small changes in specific testing parameters can influence the test result. This study also delivered data on repeatability within one testing laboratory (see Annex A) and has since been expanded to include reproducibility data from further round robin tests between different laboratories (see Annex A).

The responsibility for product specification lies with the product TCs, as described in CEN/TR 16496. This determination of emission into indoor air is carried out on products under their intended conditions of use. The intended use of a construction product is generally specified in the corresponding harmonized product standard. The specific emission rates determined using this European Standard are associated with application of the product in a defined European Reference Room under specified climate (temperature and humidity) and ventilation conditions. Converting the test results into a concentration in the air of the reference room is essential because it is not possible to evaluate emissions in all possible use scenarios.

The reference room dimensions, associated product loading factors, as well as climate and ventilation conditions are selected to represent the general indoor environment (see Clause 4). Based on the huge amount of available European experience, it was possible to identify one emission scenario and one reference room and associated set of product loading factors to be used.

This European Standard specifies the horizontal reference method for testing the emission (release) of dangerous substances from construction products into indoor air. This method uses a test chamber in which emissions are generated under conditions which are kept constant during the test. These conditions are selected so that the test results can be expressed in terms of concentrations of dangerous substances in the air of the reference room (see Clause 7 and Clause 9). It should be noted that the test chamber is defined in terms of performance requirements. This responds to the requirement of Mandate M/366 for a horizontal approach while maintaining sufficient flexibility on chamber dimensions to ensure representative samples of different materials can be accommodated (see Clause 5). Clause 8 of this European Standard specifies how emitted regulated dangerous substances should be analysed.

This European Standard also addresses separately (see Clause 11 and Annex B) indirect methods that provide a result that is comparable or that correlates with the result of the reference method within their specified field of application. Such methods may be easier and/or cheaper to apply. They are in accordance with Mandate M/366 provided that their comparability or correlation to the reference test method has been demonstrated in their specific field of application.

The selection of one emission scenario and one reference room for evaluating emissions to indoor air is in general accordance with the approach taken in existing European national regulations and voluntary schemes relating to emissions from construction products into indoor air. It also accords with the horizontal requirements of Mandate M/366. The aim of this European Standard is not to develop a new testing method but to combine by normative references the use of existing standards. This approach is complemented, when necessary, with additional and/or modified requirements to ensure all

construction products are evaluated under comparable conditions as required by the horizontal concept specified in Mandate M/366.

In summary, the horizontal test method specified in this European Standard determines the specific emission rate of vapour phase organic compounds from a construction product into indoor air. This can be converted into a concentration in the air of the reference room by calculation.

This European Standard has not been evaluated for the determination of 'steady-state' concentration of formaldehyde.

NOTE A European Standard (EN 717-1) exists for the determination of formaldehyde emissions from wood-based panels, in terms of 'steady-state' concentrations.

1 Scope

This European Standard specifies a horizontal reference method for the determination of emissions of regulated dangerous substances from construction products into indoor air. This method is applicable to volatile organic compounds, semi-volatile organic compounds, and very volatile aldehydes. It is based on the use of a test chamber and subsequent analysis of the organic compounds by GC-MS or HPLC.

NOTE 1 Supplemental information is given on indirect test methods (see Annex B) and on measuring very volatile organic compounds (see Annex C).

NOTE 2 This European Standard describes the overall procedure and makes use of existing standards mainly by normative reference, complemented when necessary with additional or modified normative requirements.

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/TR 16220:2011, *Construction products - Assessment of release of dangerous substances - Complement to sampling*

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

EN ISO 13137, *Workplace atmospheres - Pumps for personal sampling of chemical and biological agents - Requirements and test methods (ISO 13137)*

EN ISO 16000-9:2006, *Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method (ISO 16000-9:2006)*

EN ISO 16000-11, *Indoor air - Part 11: Determination of the emission of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens (ISO 16000-11)*

EN ISO 16017-1, *Indoor, ambient and workplace air - Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography - Part 1: Pumped sampling (ISO 16017-1)*

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 16000-3, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*

ISO 16000-6, *Indoor air — Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID*