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Gradbeni proizvodi - Ocenjevanje sproščanja nevarnih snovi - Določevanje emisije v notranji zrak (vključuje dopolnilo A1)

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

Bauprodukte: Bewertung der Freisetzung von gefährlichen Stoffen - Bestimmung von Emissionen in die Innenraumluft

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

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This European Standard was approved by CEN on 9 July 2017 and includes Amendment 1 approved by CEN on 24 May 2020.

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European foreword

This document (EN 16516:2017+A1:2020) 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.

〚A1〉 Amendment 1 is a complement to EN 16516:2017. It concerns the measurement of ammonia emissions from construction products. 〈A1〛

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of an identical text or by endorsement, at the latest by January 2021, and conflicting national standards shall be withdrawn at the latest by January 2021.

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 includes Amendment 1 approved by CEN on 24 May 2020.

This document supersedes 〚A1〉 EN 16516:2017 〈A1〛.

The start and finish of text introduced or altered by amendment is indicated in the text by tags 〚A1〉 〈A1〛.

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, 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, 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.centc351.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

A1⟩ This document 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, very volatile aldehydes and ammonia. It is based on the use of a test chamber and subsequent analysis of the organic compounds by GC-MS, HPLC, and for ammonia, subsequent analysis by spectrophotometric methods or any equivalent analytical methods (such as ion chromatography and ammonium specific electrode). ⟨A1

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*

A1⟩ ISO 7150-1, *Water quality — Determination of ammonium — Part 1: Manual spectrometric method* ⟨A1

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*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

NOTE 1 In the event of any conflict between the definitions of terms in the cited normative reference documents and those in EN 16687 or in this document, the definitions given in EN 16687 and this document have precedence.

NOTE 2 Several of the defined terms on product sampling are closely related, which is also depicted in Figure 1. This figure and the relevant definitions are taken from CEN/TR 16220:2011:

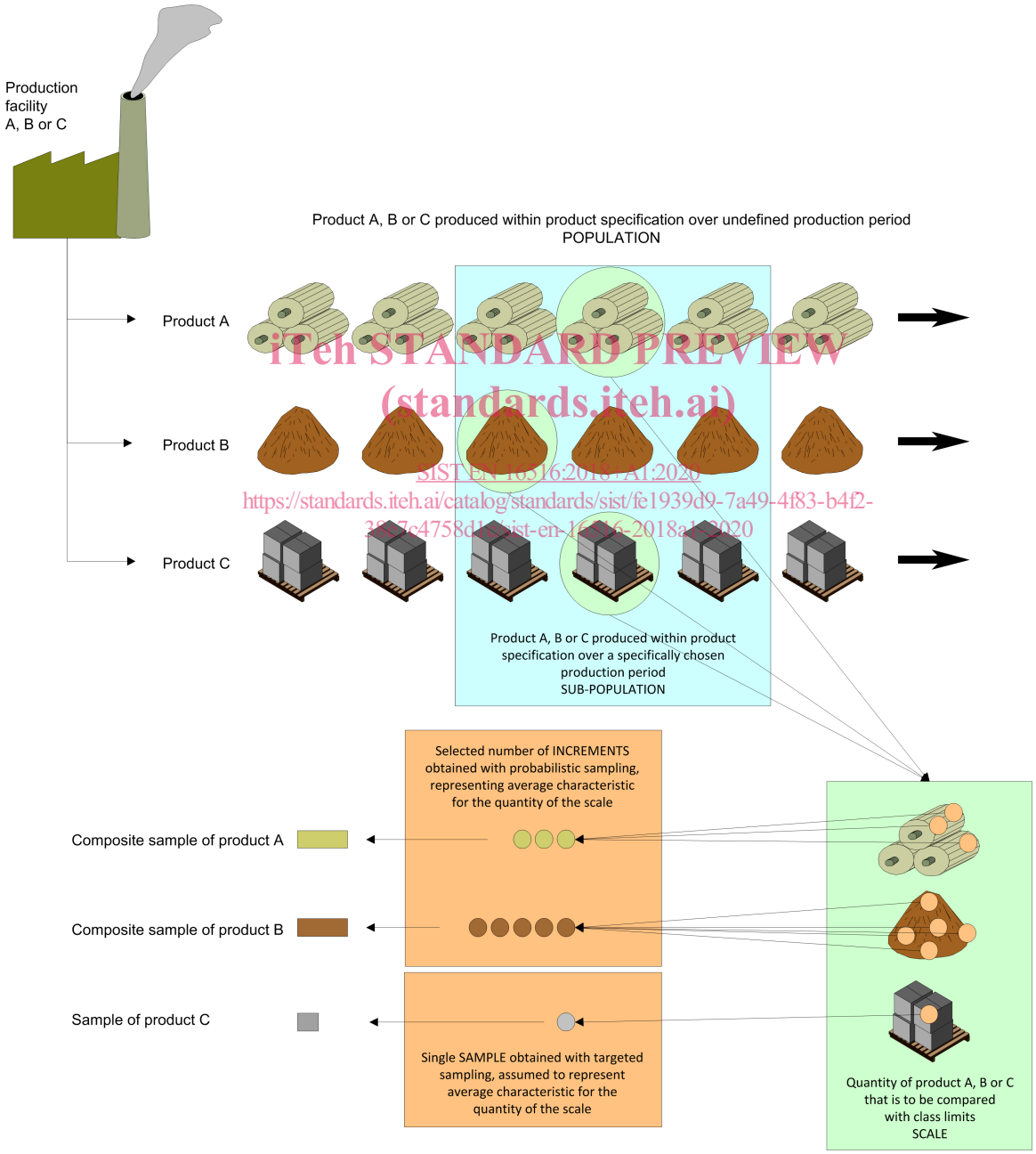

Figure 1 — Relation between the key terms of product sampling

3.1.1 Terms relating to sampling and products:

3.1.1.1
average sample
composite sample, aggregated sample
two or more increments/subsamples mixed together in appropriate proportions, either discretely or continuously(blended composite sample), from which the average result of a desired characteristic can be obtained

[SOURCE: adapted from ISO 11074:2015, 4.3.3]

3.1.1.2
curing
hardening of freshly prepared mixtures under well-defined conditions (time, temperature, humidity, etc.) specified in harmonized product standards

3.1.1.3
curing time
minimal time defined necessary for curing before an emission test can be executed to obtain test results that are relevant to in use conditions

3.1.1.4
increment
individual portion of material collected by a single operation of a sampling device

[SOURCE: adapted from ISO 11074:2015, 4.1.8 as in CEN/TR 16220:2011, 2.4.5]

3.1.1.5
laboratory sample
sample or sub-sample(s) sent to or received by the laboratory

Note 1 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: IUPAC, 2.5.5]

3.1.1.6
population
totality of items under consideration

[SOURCE: adapted from ISO 11074:2015, 4.1.11 as in CEN/TR 16220:2011, 2.4.3]

Note 1 to entry: In the case of a random variable, the probability distribution is considered to define the population of that variable.

3.1.1.7
sample
representative portion of product or material selected from a larger quantity of product or material

[SOURCE: IUPAC, 2.1.1]

3.1.1.8
sampling plan
predetermined procedure for the selection, withdrawal, preservation and transportation of product samples

[SOURCE: CEN/TR 16220:2011, 2.3]

3.1.1.9
scale
minimum quantity (mass, volume or units) of the product for which representative test results can be obtained

[SOURCE: CEN/TR 16220:2011, 2.4.4]

3.1.1.10
sub-population
defined part of the population

[SOURCE: adapted from ISO 11074:2015, 4.1.29 as in CEN/TR 16220:2011, 2.4.3]

3.1.2 Terms relating to emissions into indoor air and associated laboratory testing:

3.1.2.1
air change rate
ratio of the volume of air brought into the test chamber per hour and the volume of the empty test chamber

Note 1 to entry: Air change rate is expressed per h.

[SOURCE: adapted from EN ISO 16000-9:2006, 3.1]

3.1.2.2
air flow rate ventilation rate
air volume entering into the emission test chamber per unit of time

[SOURCE: adapted from EN ISO 16000-9:2006, 3.2]

3.1.2.3
chamber blank value
test result obtained by carrying out the test procedure in the absence of a test portion/specimen

3.1.2.4
compound recovery
measured mass concentration of a target vapour phase organic compound (VVOC, VOC or SVOC) in the air leaving the emission test chamber during a given time period divided by the actual mass concentration of the same target vapour phase organic compound added to the emission test chamber air in the same time period, expressed in percent

[SOURCE: EN ISO 16000-9:2006, 3.9]

3.1.2.5
emission
liberation of chemical substances from a construction product into air

3.1.2.6
emission test chamber
enclosure with controlled operational parameters for the determination of vapour phase organic compounds emitted from construction products

[SOURCE: adapted from EN ISO 16000-9:2006, 3.6]

3.1.2.7
emission test chamber concentration
mass concentration of a specific vapour phase organic compound (VVOC, VOC or SVOC) (or group of vapour phase organic compounds) in test chamber air measured at the emission test chamber outlet

[SOURCE: EN ISO 16000-9:2006, 3.7]

3.1.2.8
intended conditions of use
conditions that a product is expected to experience during service life and that influence its emission behaviour

3.1.2.9
mass concentration of the compound in the reference room air
calculated concentration of a specific vapour phase organic compound (VVOC, VOC or SVOC) or group of vapour phase organic compounds in the reference room

3.1.2.10
product loading factor
ratio of exposed dimension of the test specimen to the empty test chamber volume

[SOURCE: adapted from EN ISO 16000-9:2006, 3.8]

3.1.2.11
reference room
room with specified dimensions, climate and ventilation used as a reference for calculating and reporting product emissions, assuming inert surfaces

Note 1 to entry: In this European Standard, a reference room is specified in 4.2.

Note 2 to entry: The reference room serves as a convention and is a model that does not represent a real room.

3.1.2.12
specific air flow rate
q
ratio of air change rate and product loading factor

Note 1 to entry: Specific air flow rate can be expressed as the area specific air flow rate q_A, equivalent to ratio of the air flow rate and the surface area of the test specimen in [$m^3/m^2 \cdot h$], which is equivalent to the expression [m/h].

Note 2 to entry: Specific air flow rates can alternatively be volume specific (q_V expressed in $m^3/(m^3 \cdot h)$), length specific (q_L expressed in $m^3/(m \cdot h)$), mass specific (q_m expressed in $m^3/(kg \cdot h)$), or unit specific (q_u expressed in $m^3/(unit \cdot h)$).

[SOURCE: adapted from EN ISO 16000-9:2006, 3.4]

3.1.2.13
specific emission rate
SER (emission factor)
mass of a vapour phase organic compound emitted (VVOC, VOC or SVOC) per unit of product per unit of time at a given time from the start of the test

Note 1 to entry: This definition is intended to avoid confusion between the terms q (in 3.1.2.13) and q_x with a subscript (q_A, q_L, q_v, q_m, q_u used for specific air flow rate in EN ISO 16000-9:2006). The specific emission rate can be related to area, length, volume, mass or unit, expressed as SER_A in µg/(m²·h), SER_L in µg/(m·h), SER_V in µg/(m³·h), SER_m in µg/(kg·h), or SER_U expressed in µg/(u·h).

[SOURCE: adapted from EN ISO 16000-9:2006, 3.11]

3.1.2.14
test portion
quantity or volume removed from the test sample for analysis purposes, generally of known weight, area or volume

[SOURCE: IUPAC, 2.5.7]

3.1.2.15
test sample
sample, prepared from the laboratory sample from which test portions are removed for testing or for analysis

[SOURCE: IUPAC, 2.5.6]

3.1.2.16
test specimen
test portion specially prepared for emission testing in an emission test chamber in order to simulate the emission behaviour of the product under intended conditions of use

EXAMPLE In case of floorings the test portion is a defined area of the flooring. The test specimen is prepared from this by covering the edges and the back of the flooring, because these surfaces do not come into contact with the indoor air when the flooring is in normal use.

[SOURCE: adapted from EN ISO 16000-9:2006, 3.13]

3.1.3 Terms relating to determination of emitted substances:

3.1.3.1
LCI value
Lowest Concentration of Interest
substance-specific value, quoted in terms of mass concentration in the air of the reference room, for health- related evaluation of emission levels from construction products

Note 1 to entry: This term can be used in conjunction with any available list of LCI values.

3.1.3.2
limit value
numerical limit derived from national, European or contractual provisions

3.1.3.3
***R* value**
sum of all R_i values obtained during a given test

3.1.3.4
***R_i* value**
ratio C_i / LCI$_i$, where

— C_i is the mass concentration in the air of the reference room;

— LCI$_i$ is the LCI value of compound *i*

3.1.3.5
semi-volatile organic compound
SVOC
organic compounds which elute after *n*-hexadecane and up to and including *n*-docosane, on the gas chromatographic column specified as a 5 % phenyl / 95 % methyl polysiloxane capillary column minus all compounds listed in Annex G, which are considered to be VOCs and not SVOCs even if they elute after *n*-hexadecane under the specific test conditions

3.1.3.6
target compound
compound for which the test result is compared with a compound specific limit value

[SOURCE: adapted from EN ISO 16000-9:2006, 3.12]

3.1.3.7
total semi-volatile organic compounds
TSVOC

sum of the concentrations of the identified and unidentified semi-volatile organic compounds, as defined in 3.1.3.5, calculated by summing the reference room concentrations of every individual compound (target and non-target, identified and unidentified) eluting after *n*-hexadecane and up to and including *n*-docosane using the specified column, and calculated using the TIC response factor for toluene after subtracting the blank values and after excluding compounds calculated to be below 5 µg/m^3 in the air of the reference room using the TIC response factor for toluene, excluding all compounds listed in Annex G even if they elute after *n*-hexadecane under the specific test conditions

[SOURCE: adapted from EN ISO 16000-9:2006, 3.14]

3.1.3.8
total volatile organic compounds
TVOC
sum of the concentrations of the identified and unidentified volatile organic compounds as defined in 3.1.3.11, calculated by summing the reference room concentrations of every individual compound (target and non-target, identified and unidentified) eluting between *n*-hexane and *n*-hexadecane inclusively using the specified column, and calculated using the TIC response factor for toluene after subtracting the blank values and after excluding compounds calculated to be below 5 µg/m^3 in the air of the reference room using the TIC response factor for toluene, additionally all compounds listed in Annex G are included even if they elute after *n*-hexadecane or before *n*-hexane under the specific test conditions

[SOURCE: adapted from EN ISO 16000-9:2006, 3.14]