SLOVENSKI STANDARD
kSIST-TS FprCEN/TS 16516:2013

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Gradbeni proizvodi - Ocenjevanje sproščanja nevarnih snovi - Določevanje emisije v notranji zrak

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 - Détermination des émissions de substances dangereuses - Détermination des émissions dans l'air intérieur

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

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

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

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

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Foreword

This document (FprCEN/TS 16516:2013) 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 Formal Vote.

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

The current German regulation (2009/167/D) requires a different way of determining the sum of VOCs (TVOCsum). In a European standard (EN), this would have been solved through an A-deviation. As Technical Specifications (TSs) do not require the withdrawal of conflicting national documents, there is no need of an A-deviation here. Instead, information on the German way is added to the informative Annex H with information on national requirements.

Introduction

This Technical Specification is dedicated to the execution of the part of Mandate M/366 "Development of horizontal standardized assessment methods for harmonised approaches relating to dangerous substances under the Construction Products Regulation (CPR)" addressing the preparation of horizontal measurement/test methods for the determination of emission of regulated dangerous substances from construction products into indoor air. This mandate is a complement to the product mandates granted by the European Commission to CEN under the Construction Products Regulation. The harmonised products standards (hEN) developed in CEN under mandates from the European Commission, and EADs developed in EOTA/OTAB for products or kits, specify construction product(s) as put on the market and address their intended conditions of use.

This Technical Specification has gone through a robustness validation for identifying how small changes in specific testing parameters can influence the test result. This study delivered also data on repeatability within one testing laboratory (see Annex A). After performing round-robin tests with different construction products, including a significant number of testing laboratories, this Technical Specification is planned to be transformed into a European Standard (EN) after any necessary adaptations.

The information produced by applying this Technical Specification is to be used for CE marking and Assessment and Verification of Constancy of Performance. It is vital that such information is clearly linked to a specified product in a hEN or EAD. The responsibility of product specification is with the product TCs, as described in FprCEN/TR 16496. This determination of emission into indoor air is to be carried out on products under their intended conditions of use. The intended use of a construction product is generally specified in the corresponding harmonised product standard (hEN) or EAD. The specific emission rates determined using this Technical Specification are associated with application of the product in a defined European Reference Room under specified climate (temperature and humidity) and ventilation conditions. A reference room is needed since it is not possible to evaluate emissions by testing in all possible use scenarios.

The reference room dimensions, resulting product loading factors, and 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 Technical Specification 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 chemical concentrations in the air of the reference room (see Clauses 7 and 9). It is to 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 but still maintains sufficient flexibility on chamber dimensions to ensure representative samples of different materials can be accommodated (see Clause 5). Clause 8 of this Technical Specification specifies how emitted regulated dangerous substances should be analysed.

This Technical Specification also addresses separately (see Clause 11 and Annex B) indirect methods that provide, within their specific field of application, a result that is comparable or that correlates with the result of the reference method. Such methods may be easier to apply and/or be cheaper. 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. They are especially suitable for Factory Production Control testing (FPC).

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 Technical Specification is not to develop a new testing method but to combine by normative references the use of existing standards complemented, when

necessary, with additional and/or modified requirements so that – according to the horizontal concept specified in mandate M/366 – construction products can be evaluated under comparable conditions with regard to emissions into indoor air.

In summary the horizontal test method specified in this Technical Specification determines the specific emission rate of volatile 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 Technical Specification 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' concentration.

1 Scope

This Technical Specification 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 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 (Annex B) and on measuring very volatile organic compounds (see informative Annex C).

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

This Technical Specification is mainly aimed at determining the emission performance of construction products, when this is required under national provisions covered by the CPR (Regulation (EU) No. 305/2011).

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 1232, *Workplace atmospheres — Pumps for personal sampling of chemical agents — Requirements and test methods*

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

FprCEN/TR 16496, *Construction Products — Assessment of release of dangerous substances — Use of harmonised horizontal assessment methods*

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 16000-11:2006, *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 16000-11:2006)*

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 16000-3:2011, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*

ISO 16000-6:2011, *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

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

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

3.1 Terms relating to sampling and products.

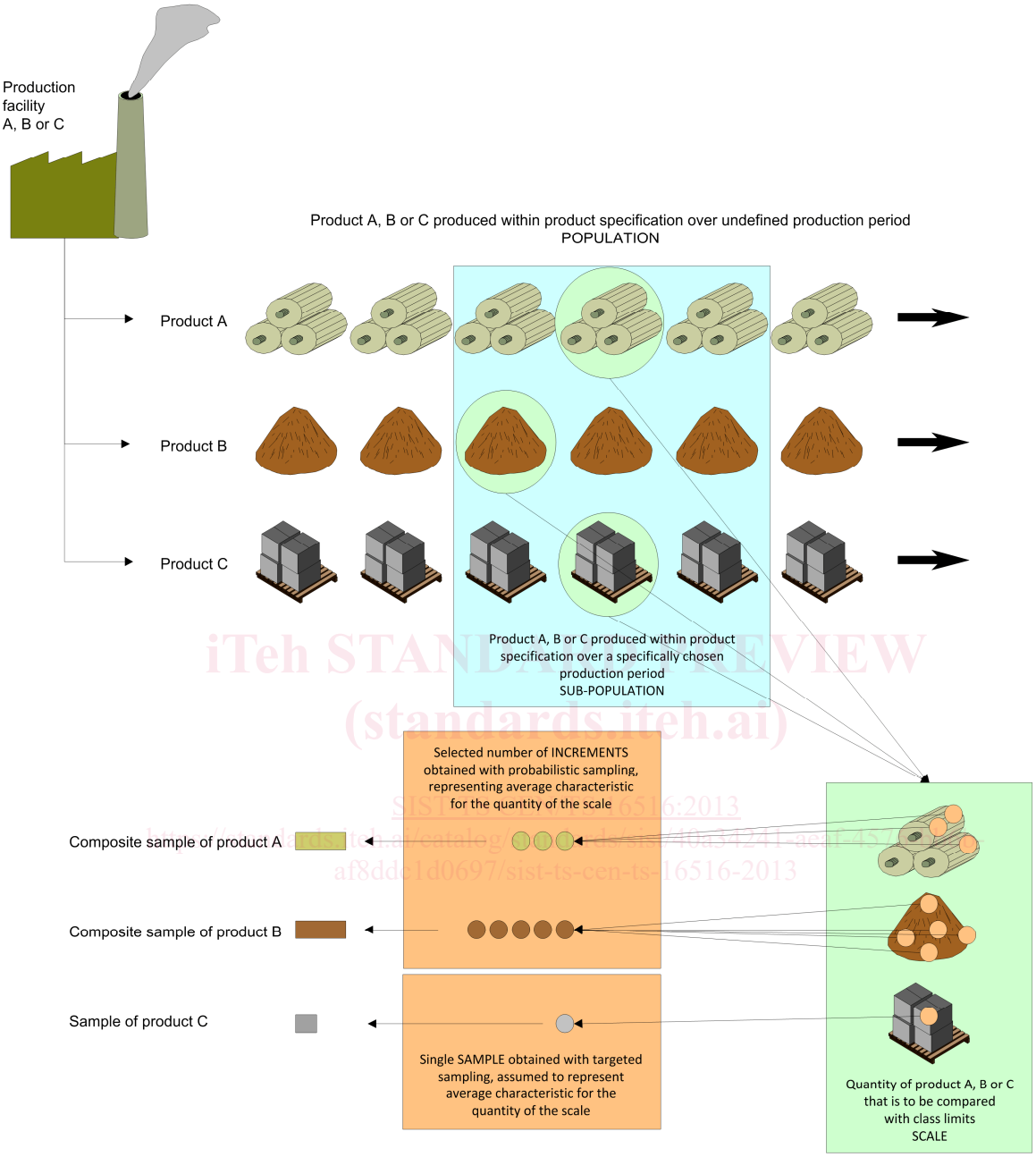

Figure 1 — Relation between the key terms of product sampling

3.1.1
composite sample
average sample, aggregated sample
sample that consists of two or more increments, put together in appropriate portions, from which the mean value of a desired characteristic may be obtained

[SOURCE: adapted from ISO 11074:2005]

3.1.2
curing
hardening of freshly prepared mixtures under well-defined conditions (time, temperature, humidity, etc) specified in harmonised product standards

3.1.3
curing time
minimal time defined necessary for curing before an emission test can be executed to perform relevant test results

3.1.4
increment
individual portion of product collected by a single operation of a sampling device which is not tested as a single entity, but is mixed with other increments in a composite sample

[SOURCE: adapted from ISO 11074:2005 as in CEN/TR 16220:2011]

Note 1 to entry: Whenever the portion of product collected by a single operation of a sampling device is analysed individually, the obtained product is called a sample. In such a situation the quantity of product should fulfil both the criteria for the size of an increment as well as for a sample.

3.1.5
laboratory sample
sample or sub-sample(s) sent to or received by the laboratory

[SOURCE: IUPAC, 2.5.5]

Note 1 to entry: When the laboratory sample is further prepared by mixing, drying, grinding or by combinations of these operations, the result is the test sample. When no preparation of the laboratory sample is required, the laboratory sample is the test sample. A test portion is removed from the test sample for the performance of the test/analysis or for the preparation of a test specimen.

Note 2 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.

3.1.6
population
totality of items under consideration

[SOURCE: adapted from ISO 11074:2005 as in CEN/TR 16220:2011]

Note 1 to entry: See also the term sub-population.

3.1.7
sample
portion of material selected from a larger quantity of material

[SOURCE: IUPAC, 2.1.1]

Note 1 to entry: The manner of selection of the sample should be described in a sampling plan.

Note 2 to entry: The term "sample" is often accompanied by a prefix (e.g. laboratory sample, test sample, test specimen) specifying the type of sample and/or the specific step in the sampling process to which the obtained material relates.

3.1.8
sampling plan
predetermined procedure for the selection, withdrawal, preservation and transportation of product samples

[SOURCE: CEN/TR 16220:2011]

3.1.9
scale
minimum quantity (mass or volume) of the product for which test results are obtained

[SOURCE: CEN/TR 16220:2011]

Note 1 to entry: Information on characteristics of the product, including emission and variations therein, for a quantity of product smaller than the defined scale, is judged to be not relevant for description of product properties, e.g. for evaluation of emissions into indoor air .

3.1.10
sub-population
defined part of the population that is targeted for the purposes of testing

[SOURCE: adapted from ISO 11074:2005 as in CEN/TR 16220:2011]

Note 1 to entry: See also the term population.

EXAMPLE Consider a continuous production process that results in a specific product. The population for that product is all the individual products produced between the moment the production process started (this may be years ago) and the moment the production process ends (this may be years ahead). From the perspective of testing, this definition does not provide a practical concept. Products produced in the past are no longer available for testing, while products that might be produced in the (far) future are neither available. The term sub-population provides a workable alternative, as the "start" and "end" of the sub-population can be defined in a practical way. For the same product, already in production for a number of years, the sub-population might be the production of a year, the production of a month, or what other definition is practical.

3.2 Terms relating to emissions into indoor air and associated laboratory testing.

3.2.1
air change rate
ratio of the volume of air brought into the test chamber per hour and the free test chamber volume measured in identical units

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

3.2.2
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]

Note 1 to entry: Air flow rate is expressed in litres per second or in cubic metres per hour (l/s, m^3/h).

3.2.3
chamber blank value
test result obtained by carrying out the test procedure in the absence of a test portion/specimen

Note 1 to entry: Blank value is expressed in micrograms per cubic meter ($\mu g/m^3$).

3.2.4
compound recovery
measured mass concentration of a target volatile organic compound in the air leaving the emission test chamber during a given time period divided by the mass concentration of the same target volatile 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]

Note 1 to entry: The recovery provides information about the performance of the entire method.

3.2.5
emission
liberation of chemical substances from a construction product into air

Note 1 to entry: Emission may be expressed as an emitted quantity in terms of concentrations in a defined volume of air or in terms of emission rate per hour and per unit quantity of the construction product (i.e. per area, length, mass, volume, unit or component).

Note 2 to entry: The terms "emission" and "release" have fundamentally the same meaning. However, by tradition, the term "emission" is used when describing liberation of chemical substances or radiation into air and the term "release" is used when describing the liberation of chemical substances into soil or water.

3.2.6
emission test chamber
enclosure with controlled operational parameters for the determination of volatile organic compounds emitted from construction products

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

3.2.7
emission test chamber concentration
mass concentration of a specific volatile organic compound, VOC, (or group of volatile organic compounds) in test chamber air measured in the emission test chamber outlet

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

3.2.8
intended conditions of use
conditions that a product may experience during service life and that influence its release/emission behaviour

Note 1 to entry: These conditions are expressed in parameters such as temperature, amount of water during exposure, wetting/drying; intended conditions of use may vary for instance as a function of time, location, orientation, geographical location, etc. For simplification intended conditions of use are transferred into release scenarios for test purposes.

3.2.9
mass concentration of the compound in the reference room air
mass concentration of a specific volatile organic compound, VOCs, (or group of volatile organic compounds) in a reference room

3.2.10
product loading factor
ratio of exposed dimension of the test specimen to the free test chamber volume

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

Note 1 to entry: The product loading factor is often expressed as the ratio of the exposed area of the test specimen and the volume of the test facility (L_A expressed in m^2/m^3). The product loading factor can also be expressed as ratio of the exposed length, volume or unit(s) of the test specimen and the volume of the emission test facility (L_L expressed in m/m^3, L_V expressed in m^3/m^3 or L_U expressed in u/m^3).

3.2.11
reference room
room with conventional dimensions, climate and ventilation used as reference for any specification of emission testing and any calculation of VOC concentration in indoor air

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

3.2.12
specific air flow rate
q
ratio of air change rate and product loading factor

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

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*h], which is equivalent to the expression [m/h].

Note 2 to entry: This definition includes other specific air flow rates than only the area specific air flow rate. Specific air flow rates can also be volume specific (q_v expressed in $m^3/(m^3$*h)), length specific (q_L expressed in m^3/(m*h)), mass specific (q_m expressed in m^3/(kg*h)), or unit specific (q_u expressed in m^3/(unit*h)).

3.2.13
specific emission rate SER (emission factor)
product specific rate describing the mass of a volatile organic compound emitted per unit of product per unit of time at a given time from the start of the test

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

Note 1 to entry: This definition is intended for avoiding confusion between the terms *q* (in 3.2.12) and *q* (used for specific air flow rate in EN ISO 16000-9). 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).

3.2.14
test portion
quantity or volume removed from the test sample for analysis purposes, generally of known weight or volume

[SOURCE: IUPAC, 2.5.7]

3.2.15
test sample
sample, prepared from the laboratory sample from which test portions are removed for testing or for analysis

[SOURCE: IUPAC, 2.5.6]

3.2.16
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

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

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 have contact to the indoor air under service life conditions.

3.3 Terms relating to determination of emitted substances.

3.3.1
LCI value
Lowest Concentration of Interest
substance-specific value for health-related evaluation of the emission from construction products

3.3.2
limit value
numerical limit derived from national, European or contractual provisions

3.3.3
non-target compound
compound for which the result is not compared with a compound specific limit value

3.3.4
R value
sum of all R_i values

3.3.5
***R_i* value**
Ratio C_i / LCI_i, where

— C_i is the chamber mass concentration of compound *i*, and

— CI_i is the LCI value of compound *i*

3.3.6
semi-volatile organic compounds
SVOC
all organic compounds which, in a capillary column as specified in 8.2.2, are eluting with a retention range between n-hexadecane (excluded) and n-docosane (included)

Note 1 to entry: The measurement is carried out using a capillary column coated with 5 % phenyl/95 % methyl-polysiloxane.

Note 2 to entry: This definition corresponds to volatile organic compounds with a boiling point approximately higher than 287 °C.

Note 3 to entry: Other definitions are given by the World Health Organization (WHO) 1987, ISO 16000-6.

3.3.7
target compound
compound for which the result is compared with a compound specific limit value

[SOURCE: adapted from EN ISO 16000-9:2006, 3.12 and modified for the purpose of this Technical Specification]

3.3.8
total semi-volatile organic compounds
TSVOC
sum of the concentrations of the identified and unidentified volatile organic compounds eluting with a retention range between n-hexadecane (excluded) and n-docosane (included) on a gas chromatographic column as specified in 8.2.2

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

Note 1 to entry: The measurement is carried out using a capillary column coated with 5 % phenyl/95 % methyl-polysiloxane.

3.3.9
total volatile organic compounds
TVOC
sum of the concentrations of the identified and unidentified volatile organic compounds eluting between and including n-hexane and n-hexadecane on a gas chromatographic column as specified in 8.2.2

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

Note 1 to entry: The measurement is carried out using a capillary column coated with 5 % phenyl/95 % methyl-polysiloxane.

3.3.10
very volatile organic compounds
VVOC
all volatile organic compounds eluting before n-hexane on a gas chromatographic column as specified in 8.2.2

Note 1 to entry: This definition corresponds to volatile organic compounds with a boiling point lower than approximately 68 °C.