PD CEN/TS 16637-1:2014

BSI Standards Publication

# Construction products — Assessment of release of dangerous substances

## Part 1: Guidance for the determination of leaching tests and additional testing steps

## National foreword

This Published Document is the UK implementation of CEN/TS 16637-1:2014.

The UK participation in its preparation was entrusted to Technical Committee B/557, Construction products — Assessment of dangerous substances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.


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# CEN/TS 16637-1

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English Version

# Construction products - Assessment of release of dangerous substances - Part 1: Guidance for the determination of leaching tests and additional testing steps

Produits de construction - Evaluation de l'émission de substances dangereuses - Partie 1: Guide pour la spécification des essais de lixivation et des étapes supplémentaires d'essai

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Teil 1: Leitfaden für die Festlegung von Auslaugprüfungen und zusätzlichen Prüfschritten

This Technical Specification (CEN/TS) was approved by CEN on 25 February 2014 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.

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# Foreword

This document (CEN/TS 16637-1:2014) 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.

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 deals with the determination and use of test methods for leaching of construction products taking specific situations into account. It specifies preconditions under which leaching tests for monolithic products and for granular products need to be selected.

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 [1], and CEN/TR 16496 [2]).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: 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 informative introduction describes the interactions and interrelations between the release tests developed to assess the release of dangerous substances from construction products into soil, surface water and groundwater 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 horizontal test to assess surface dependent release from monolithic, plate-like or sheet-like construction products while FprCEN/TS 16637-3 (in preparation) will describe a horizontal test to assess release from granular construction products. The test methods 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.

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 conditions of use in relation to CE marking and assessment and verification of constancy of performance.

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 Annex A and Annex B of CEN/TS 16637-1 and to CEN/TR 16098 [1], 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 conditions of use of the construction product (e.g. above ground exposed to the precipitation, or shielded from direct infiltration, in surface or groundwater) 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 of the different CEN Members and to check the influence of testing conditions on the test result (e.g. temperature, flow rate, renewal scheme, etc. [3]). 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 allows the identification of the appropriate leaching test method for the determination of the release of Regulated Dangerous Substances from construction products into soil, surface water and groundwater. This document provides a stepwise procedure for the determination of appropriate release tests, including:

a) guidance for the identification of construction products potentially emitting Regulated Dangerous Substances;

b) determination of the test method based on general product properties;

c) choice of the test method using specific product properties.

(2) Furthermore, this Technical Specification gives general guidance for CEN Technical Product Committees on basic aspects (sampling, sample preparation and storage, eluate treatment, analysis of eluates and documentation) to be specified in the relevant product standards.

(3) Metallic products, coatings on metallic products and organic coatings for metals are not considered in the determination scheme of this Technical Specification since the test method in CEN/TS 16637-2 (tank test) is not appropriate for the testing of these construction products due to a different release mechanism (solubility control).

NOTE Metallic products are excluded from the scope of CEN/TS 16637-2 because the principles of that test (diffusion) are not obeyed by these products. Metallic products have shown pH dependent solubility control, which means that metals released from the oxidation layer on the metal until the maximum possible solubility level at the prevailing pH conditions in the surrounding water is reached (more water in contact with the same metal surface means more metals released and more time does not lead to more release due to solubility control). Maximum level of release can often be reached in minutes to hours. More generally, it can be stated that expression of results for metallic surfaces in mg/(m2·s) is always “conditional”, i.e. dependent on the local conditions at which the measurements were done, such as the volume of water relative to the surface area. For impact assessment, it is necessary to understand the above mentioned effects and to capture these effects in a test reflecting the dominant release mechanism. However, such a test method is currently unavailable. If the intrinsic leaching behaviour is known, release under specified local conditions could be determined by modelling. Furthermore, no notified regulations exist for metallic products at the time these Technical Specifications have been published.

(4) It is assumed that intermittent contact with water (e.g. exposure to rainwater) is tested - by convention - as permanent contact. For some coatings, (e.g. some renders with organic binders according to EN 15824) in intermittent contact to water, physical and chemical properties might be altered in permanent contact with water. These products are not considered in the determination scheme of this Technical Specification since the test method in CEN/TS 16637-2 is not appropriate for the testing of these construction products.

# 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/TS 16637-2:2014, *Construction products — Assessment of release of dangerous substances — Part 2: Horizontal dynamic surface leaching test*

# 3 Terms and definitions

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

## 3.1 Sampling and products

**3.1.1**
**compacted granular product**
granular product with a low permeability, due to very small pores between the particles

Note 1 to entry: Compacted granular products are usually tested by a method for granular construction products with low hydraulic conductivity, because the percolation test is not applicable due to the low permeability of the products.

**3.1.2**
**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: ISO 11074:2005 [4], 4.3.3, modified – editorial amendments]

**3.1.3**
**curing**
hardening of freshly prepared mixtures under well-defined conditions (time, temperature, humidity, etc.) specified in harmonized product standards

**3.1.4**
**curing time**
(minimal) time defined as necessary for curing before a release test can be executed to perform relevant test results

**3.1.5**
**granular product**
product composed of solid particles with a particle size smaller than a specified size or grading

Note 1 to entry: Granular products are usually tested by a percolation test. A Technical Specification on the percolation test is under preparation.

**3.1.6**
**increment**
individual portion of product collected by a single operation of a sampling device which will not be tested as a single entity, but will be mixed with other increments in a composite sample

[SOURCE: ISO 11074:2005 [4], 4.1.8, modified – editorial amendments]

**3.1.7**
**laboratory sample**
sample or sub-sample(s) sent to or received by the laboratory

[SOURCE: IUPAC 1990 [5], 2.5.5]

Note 1 to entry: When the laboratory sample is further prepared by subdividing, cutting, sawing, coring, mixing, drying, grinding, curing 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.

**3.1.8**
**monolithic granular product**
granular product with specific requirements on the grain size distribution to be tested in the dynamic surface leaching test (DSLT)

**3.1.9**
**monolithic product**
product which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time in the considered intended conditions of use

Note 1 to entry: Monolithic products are usually tested by a dynamic surface leaching test.

**3.1.10**
**plate-like product**
product formed as a semi-rigid or rigid plate, which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time in the considered intended conditions of use

Note 1 to entry: Plate-like products are usually tested by a dynamic surface leaching test.

**3.1.11**
**population**
<sampling> totality of items under consideration

[SOURCE: ISO 11074:2005, [4], 4.1.11, modified – without note, editorial amendments

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

**3.1.12**
**sample**
portion of material selected from a larger quantity of material

[SOURCE: IUPAC 1990 [5], 2.1.1]

Note 1 to entry: The manner of selection of the sample should beprescribed in a sampling plan (3.1.13).

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

**3.1.13**
**sampling plan**
predetermined procedure for the selection, withdrawal, preservation and transportation of product samples

**3.1.14**
**scale**
minimum quantity (mass or volume) of the product for which test results are obtained

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 unimportant.

[SOURCE: CEN/TR 16220:2011 [6], Annex A, 3]

**3.1.15**
**sheet-like product**
product formed as a flexible or semi-flexible sheet, which has certain minimum dimensions and physical and mechanical properties that ensure its integrity over a certain period of time in the considered intended conditions of use

Note 1 to entry: Sheet-like products are usually tested by the dynamic surface leaching test.

**3.1.16**
**sub-population**
<sampling> defined part of the population that is targeted for the purposes of sampling

[SOURCE: ISO 11074:2005, [4], 4.1.29, modified - specified]

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.

**3.1.17**
**test portion**
amount of the test sample taken directly for testing/analysis purposes, usually of known weight or volume

[SOURCE: IUPAC 1990 [5], 2.5.7]

EXAMPLE A bag of aggregates is delivered to the laboratory (the laboratory sample). For test purposes a certain amount of the aggregate is dried, the result is the test sample. Afterwards the column for a percolation test is filled with a test portion of dried aggregate.

**3.1.18**
**test sample**
sample, prepared from the laboratory sample from which test portions are removed for testing or for analysis

[SOURCE: IUPAC:1990 [5], 2.5.6]

**3.1.19**
**test specimen**
test portion specially prepared for release testing in a test facility in order to simulate the releasebehaviour of the product under intended conditions of use

EXAMPLE Cement is used in construction as ingredient for concrete. For testing purposes, a test specimen of concrete is prepared for the release test, using a test portion of cement and adding additional ingredients (like aggregates) with a well-known leaching behaviour.

## 3.2 Release and laboratory testing

**3.2.1**
**test method for granular construction products with low hydraulic conductivity**
GLHC
release test method in which a granular construction product with low hydraulic conductivity is exposed with one defined surface to a leachant renewed at subsequent time intervals

**3.2.2**
**digestion**
mineralization of the organic matter of a sample and dissolving of its mineral part (as completely as possible) when reacted with a reagent mixture

Note 1 to entry: Usually done with a strong, concentrated acid like aqua regia or nitric acid to dissolve inorganic substances for chemical analysis.

[SOURCE: CEN/TR 16045:2010 [4], 2.2.2]

**3.2.3**
**dynamic surface leaching test**
DSLT
release test method in which a monolithic, sheet-like or plate-like product is immersed in a leachant renewed at subsequent time intervals

Note 1 to entry: See also the term “tank leaching test”.

**3.2.4**
**eluate**
solution recovered from a leaching test

Note 1 to entry: See also the term “leachate”.

[SOURCE: EN 12457-1:2002 [8], 3.3]

**3.2.5**
**leachant**
liquid that is brought into contact with the test portion in the leaching procedure

Note 1 to entry: Usually demineralized water is used as leachant for laboratory leaching tests.

**3.2.6**
**extraction**
dissolution of substances in a solvent for subsequent chemical analysis

Note 1 to entry: Usually done with an organic solvent to extract organic substances for chemical analysis or for special analysis of inorganic substances.

[SOURCE: CEN/TR 16045:2010 [7], 2.2.5]

**3.2.7**
**impact assessment**
model calculation with the purpose to assess the concentrations of Regulated Dangerous Substances at the point(s) of compliance

Note 1 to entry: Impact assessment use the release test results (the source term) to calculate the environmental concentration values of the substances at the point(s) of compliance by modelling the environmental transport for specified intended uses and for specified intended conditions of use. The final step is the comparison of the predicted environmental concentrations with the environmental limit values at the point(s) of compliance (impact evaluation).

Note 2 to entry: Impact assessment is not part of the standardization work in CEN/TC 351. The regulator is responsible for the definition of relevant intended conditions of use, the modelling of the environmental transport, the point of compliance and the limit values at the point of compliance.

**3.2.8**
**impact evaluation**
comparison of (predicted) environmental concentrations of substances to regulatory limit values in soil, surface water or groundwater at a point of compliance as a result of release from construction products

Note 1 to entry: Such predictions are made based on the results of release tests which are translated to intended conditions of use by modelling the source term and the environmental transport.

Note 2 to entry: The translation of test results to environmental concentrations is not part of standardization work in CEN/TC 351.

**3.2.9**
**intended use**
intended use of the construction product as defined in the applicable harmonized Technical Specification

**3.2.10**
**intended conditions of use**
conditions of intended use
conditions that a product may be subjected to during service life and that influence its release 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.

**3.2.11**
**leaching behaviour**
release and change with time in release from a solid product upon contact with a leachant as a function of major release controlling factors

Note 1 to entry: Such factors are diffusion, pH, L/S or time.

**3.2.12**
**modelling of environmental transport**
modelling of environmental path
transport term
theoretical estimation of the transport of substances in the environment under specific intended conditions of use based on test results or the source term for release of these substances

**3.2.13**
**percolation test**
PT
column test
release test method to determine the release of substances from a granular construction product packed in a column with a leachant percolating through it

Note 1 to entry: A Technical Specification on the percolation test is under preparation.

**3.2.14**
**point of compliance**
point where concentrations of substances should comply with regulatory limit values for soil and/or groundwater at a certain distance from the source

**3.2.15**
**Regulated Dangerous Substances**
RDS
substances, ions and radioactive substances that may present a danger for man or the environment during normal use of construction products when installed in works and for which at least one European member state has notified a regulation or the European Union has a Community regulation (including European directives and regulations)

[SOURCE: CEN/TR 15858:2009 [9], 3.31, modified – without notes, editorial amendments]

**3.2.16**
**release**
liberation of chemical substances (e.g. non-volatile organic compounds, heavy metals, salts) from a construction product into soil, surface water or groundwater or into the leachant of a test facility

Note 1 to entry: Release to soil, surface and groundwater may be expressed in terms of area related release (tank leaching test, e.g. $mg/m^2$) or in terms of mass related release (percolation test, e.g. mg/kg).

**3.2.17**
**release mechanism**
physico-chemical processes that control the release of substances from a solid construction product into a leachant

Note 1 to entry: In the case of monolithic products, the main release mechanisms for substances are diffusion of substances, dissolution of substances, initial surface wash-off of substances and/or dissolution of the matrix. In case of granular products the main release mechanisms are washout and solubility. Additional factors like pH or DOC also have influence on the magnitude of the release.

Note 2 to entry: The release mechanism for every substance can be determined using the results of the release test (tank leaching test, percolation test). Determination of the release mechanism is relevant for modelling of the source term and so for determination of the effects on soil and water over a time period.

**3.2.18**
**release scenario (related to test method)**
model description of the release of substances from construction products into their immediate soil and water environments and of the chemical, physical and geometrical parameters that influence this release; this description forms the basis for defining the test methods as a function of the products and its intended use

Note 1 to entry: For soil, groundwater and surface water, three release scenarios have been defined for impermeable, low permeable and permeable construction products. Release scenario should not be confused with modelling of environmental transport.

**3.2.19**
**source term**
calculated, long term release rate or release function of a substance from a product related to intended conditions of use, which is used for modelling of environmental transport

**3.2.20**
**tank leaching test**
tank test
dynamic surface leaching test (DSLT) or test method for granular construction products with low hydraulic conductivity (GLHC)

**3.2.21**
**testing laboratory**
laboratory which measures, examines, tests, calibrates or otherwise determines the characteristics or performance of materials or construction products

## 4 Symbols and abbreviations

DSLT Dynamic Surface Leaching Test

EOTA European Organization for Technical Approvals

ETA European Technical Approval/Assessment

FPC Factory Production Control

GLHC Test method for Granular products with Low Hydraulic Conductivity

hEN Harmonized European Standard

PTD Product Type Determination

PT Percolation Test

RDS Regulated Dangerous Substances

# 5 Determination of the appropriate release test method

## 5.1 Step 1: Information on construction products that may be examined by leaching tests

This clause gives information for identification of construction products that maybe examined by leaching tests.

NOTE 1 All construction products are able to release substances to soil, groundwater and surface water due to the contact with water during the use of the product. Further background is given in CEN/TR 16098 [1].

NOTE 2 Obligations on leaching testsarise when the standardization mandates[1)] to CEN are amended by the European Commission to include requirements on the release of Regulated Dangerous Substances into the product specifications (hEN or ETA). Background for the extension of the product mandates are existing national and European regulations. A significant part of this legislation is collated in a European database “CP-DS” (construction products — dangerous substances)[2)].

## 5.2 Step 2: Determination of test method

### 5.2.1 Principles and general review of the test methods

(1) The user of this Technical Specification shall determine the appropriate test methods for the respective product(s) in applying the stepwise procedure given in this Technical Specification. Furthermore the CEN Product Technical Committees or the EOTA experts shall determine the appropriate test methods for the respective product(s) in close cooperation with CEN/TC 351 applying the stepwise procedure given in this Technical Specification.

(2) To determine the release of Regulated Dangerous Substances from construction products into soil, surface water and groundwater generally two different test set-ups are applicable:

a) The dynamic surface leaching test (DSLT) according to CEN/TS 16637-2.

CEN/TS 16637-2 specifies a method to determine as a function of time the release of substances from a monolithic, plate-like or sheet-like product or from granular construction products with low hydraulic conductivity with a leachant in contact with its surface. A test portion of the product is placed in a reactor/leaching vessel and the exposed surface is completely submerged in a leachant. The leachant is introduced in the reactor up to a given volume of liquid to surface area ratio (L/A ratio), at a given temperature. The concentration of the relevant Regulated Substances is analysed in the individual fractions of the eluate.

b) The percolation test (PT) according to FprCEN/TS 16637-3 (in preparation).

Typically granular construction products are subjected to percolation with water as a function of liquid to solid ratio (L/S ratio) under specified percolation conditions. The construction products are leached under hydraulically dynamic conditions. The eluates are collected in different fractions and the concentrations of the relevant Regulated Dangerous Substances are analysed in the individual fractions. The method is a once-through column leaching test and the test results establish the distinction between different release patterns, for instance wash-out and release under the influence of interaction with the matrix, when approaching local equilibrium between construction product and leachant (for inorganic substances).

NOTE A Technical Specification on the percolation test is under preparation in CEN/TC 351/WG1. The protocol on the percolation test will be included into this Technical Specification giving clear guidance on the selection of either the tank leaching test or the percolation test for the determination of the release of Regulated dangerous Substances from construction products.

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1) The mandate amendments for dangerous substances are currently under preparation. All mandates for construction products are available under:
http://ec.europa.eu/enterprise/standards_policy/mandates/database/index.cfm?fuseaction=genSearch.main

2) See http://ec.europa.eu/enterprise/construction/cpd-ds/.

(3) The point of departure for test determination is that the test method reflects the presumed dominant release mechanism in practice. The basic distinction is made on whether the construction product in its intended use is expected to show release mainly through diffusion or percolation.

(4) The dominant release mechanism in practice is linked to general product properties allowing the choice of the appropriate test method. The product properties are easy to determine characteristics such as composition, shape, size and durability/stability of the construction product, as it appears during intended use. These general properties of a product lead to one of two “release scenarios” as explained in the informative Annex A. The release scenario is a description of the dominant release mechanisms expected in practice for a certain product category with the same general properties. Each release scenario is associated with one test method:

a) Release scenario I (impermeable or low permeable “monolithic”, “sheet-like” or “plate-like” non-metallic products; mainly diffusion controlled release): dynamic surface leaching test according to CEN/TS 16637-2 (standard procedure or method for granular construction products with low hydraulic conductivity according to Annex A of CEN/TS 16637-2:2014 for a few products with specific properties);

b) Release scenario II (permeable “granular” products; release mainly controlled by equilibrium-like conditions and percolation): percolation test according Technical Specification under preparation of CEN/TC 351/WG 1.

### 5.2.2 Product properties and test conditions for the determination of the relevant test method

a) Monolithic products:

1) Monolithic products to be tested according to CEN/TS 16637-2 are:

i) products with all dimensions > 40 mm or a volume > 64 000 $mm^3$ (64 $cm^3$);

ii) flat products (sheet-like, plate-like) with an area > 10 000 $mm^2$ (100 $cm^2$) and one dimension < 40 mm (4 cm);

iii) monolithic granular products fulfilling the requirements of EN 13450 for railway ballast (categories $G_C$ RB A, $G_C$ RB B, $G_C$ RB C, $G_C$ RB D) or EN 13383-1 for armourstone with a density of at least 2 300 $kg/m^3$ and corresponding to the requirements in Table 1. The dimensions of the test pieces shall be in line with paragraph 1), i).

**Table 1 — Requirements on monolithic granular product**

| Sieve size | Percentage passing by mass |
|---|---|
| 63 mm | ≤ 100 |
| 40 mm | ≤ 75 |
| 22,4 mm | ≤ 7 |

2) For tiles that are produced in smaller entities that do not fulfil the size requirements for testing as a monolithic or plate-like product but are intended to be used as larger, combined entities that do fulfil the criteria, the test can be carried out on larger samples prepared from the smaller entities in accordance with intended use.

3) Examples of construction products (impermeable products or products of low permeability) to be tested according to CEN/TS 16637-2 are:

i) facade (e.g. bricks, concrete, wood panels, glazings, coatings);

ii) roof (e.g. flexible roofing covers);

iii) pavement (e.g. concrete, paving stone, asphalt cover, concrete slabs);

iv) foundation (e.g. concrete, blocks);

v) coastal protection (e.g. armourstone or large concrete blocks withstanding wave action);

vi) railway ballast;

vii) glass tiles.

b) Monolithic products draining water in their intended use:

1) Although products draining water have a high internal surface exposed to draining water, the situation may be rather comparable to that of a monolithic product. The surface area in contact with the water phase is much larger than the outer surface and can hardly be determined. These products shall be tested in a tank test (DSLT) according to CEN/TS 16637-2 after preparing test specimens by cutting, coring or moulding. The external geometric surface of the specimen shall be used for the calculation of the release.

2) Examples for these types of products are:

i) open asphalt concretes used in road construction and in water works;

ii) drainage tiles.

c) Granular construction products:

1) Sample preparation procedures and test conditions for granular construction products are still under preparation within CEN/TC 351/WG 1.

2) General examples of permeable granular construction products to be tested according to a percolation test are:

i) natural, manufactured or recycled aggregate (e.g. slag, recycled concrete aggregate) for road shoulders or road-base;

ii) unbound aggregate for parking lots;

iii) steel slag and phosphorous slag for road construction;

iv) crushed clay masonry for road construction.

d) Granular construction products with low hydraulic conductivity:

1) In cases where fine aggregates do not allow significant percolation of water through the solid material in a regular percolation test, the method for granular products with low hydraulic conductivity (GLHC) according to CEN/TS 16637-2:2014, Annex A, Table A.1, is to be used.

NOTE 1 The method for granular products with low hydraulic conductivity according to CEN/TS 16637-2:2014, Annex C, is a special mode of the DSLT.

NOTE 2 Previous studies have indicated that the point at which a regular percolation test becomes infeasible for these products is at permeabilities in the order of $10^{-8}$ m/s. This also is the level at which it can be calculated that diffusion will start to be the dominant release mechanism in practical situations. This may indeed require an iteration

through the test scheme, as there will be cases in which it is not known beforehand whether a percolation test will work before it has been tried.

2) Examples of granular construction products with low hydraulic conductivity:

   i) granular product with clayey or hydraulic properties;

   ii) highly compacted granular product.

3) The choice of the appropriate test method using general product properties and test conditions is indicated in Figure 1.

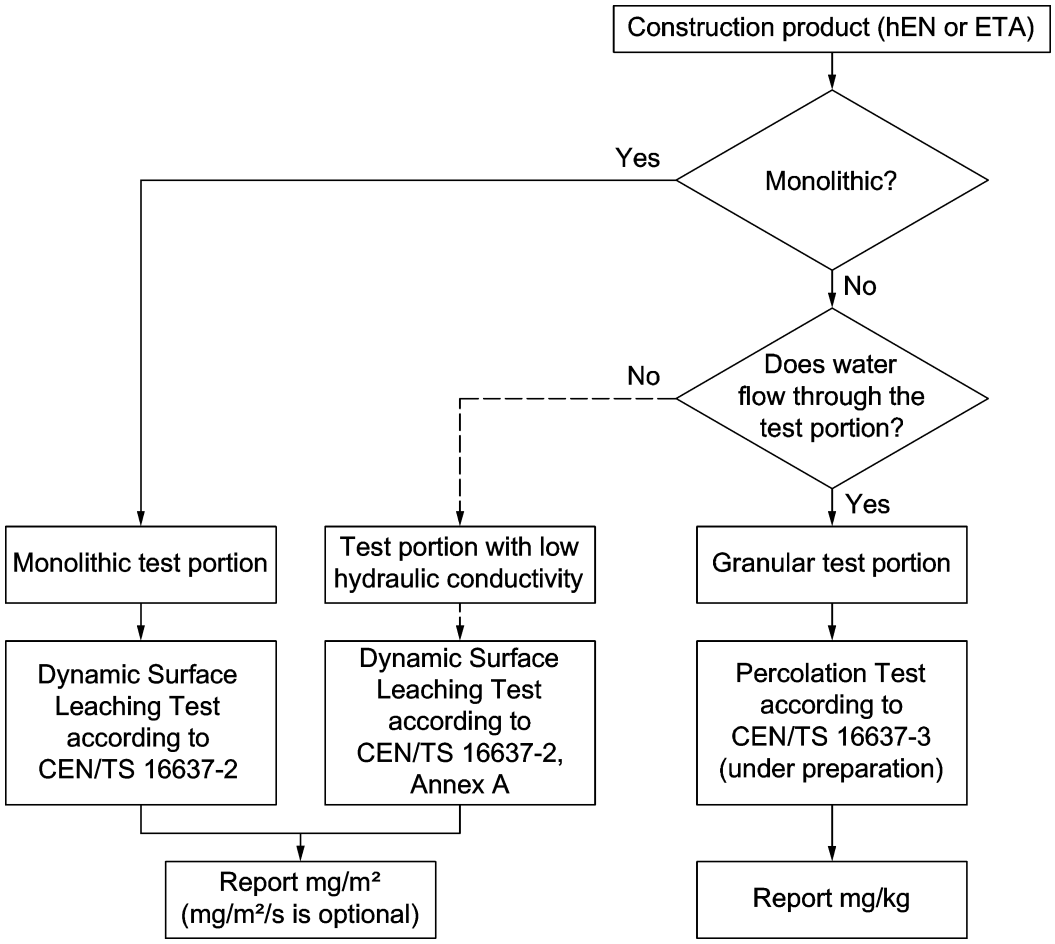



**Figure 1 — Scheme for the determination of leaching tests for construction products**

**Explanations to Figure 1**

**Monolithic products:** Specification of the dimensions of monolithic products:

— All dimensions > 40 mm (volume > 64 000 $mm^3$ (64 $cm^3$));

— Flat products (sheet-like, plate-like), area > 10 000 $mm^2$ (100 $cm^2$) and one dimension < 40 mm (4 cm);

— Monolithic products draining water under conditions of intended use;

— Monolithic granular product corresponding to the requirements in Table 1.

**Granular products:**

Details on sample preparation (e.g. grain size) and test conditions under preparation.

# 6 Adoption of modules for the product specific leaching standard

## 6.1 Overview of the modules

(1) This paragraph is aimed to give the CEN Product Technical Committees general guidance on critical issues relevant in the chain from sampling to reporting when testing the release of RDSs from construction products into soil, groundwater and surface water. This enables the CEN Product Technical Committees to compose adequate overall sampling and laboratory test procedures fit for their specific products in their specific situations. Some of the general aspects considered in this Technical Specification may be refined in the CEN/TS 16637-2 or in the future Technical Specification on the percolation test.

(2) A full test procedure can be described as a series of steps, i.e. definition of a sampling plan, taking of sample, on site sample pre-treatment, packaging, preservation, storage and transportation, delivery, storage and transportation to the laboratory, delivery, storage and preservation in the laboratory, preparation of the test portion, test to determine the release, analysis/quantification, data management and reporting. These steps should be closely interlinked. This Technical Specification only provides guidance on the first few steps, from defining the sampling plan up to the delivery of the laboratory sample to the laboratory. This is depicted in Figure 2 wherein the main steps are numbered (1 to 7).

(3) When defining part of this whole chain of activities, the implications of the whole chain should be taken into consideration in order to ensure that the test result is fit for purpose.

(4) The allocation of the different modules to the relevant Technical Specifications is as follows:

a) sampling: this Technical Specification;

b) sample preparation: Technical Specifications of the leaching tests;

c) leaching method: Technical Specifications of the leaching tests;

d) eluate analysis: Technical Specifications of the leaching tests;

e) test report: Technical Specifications of the leaching tests.

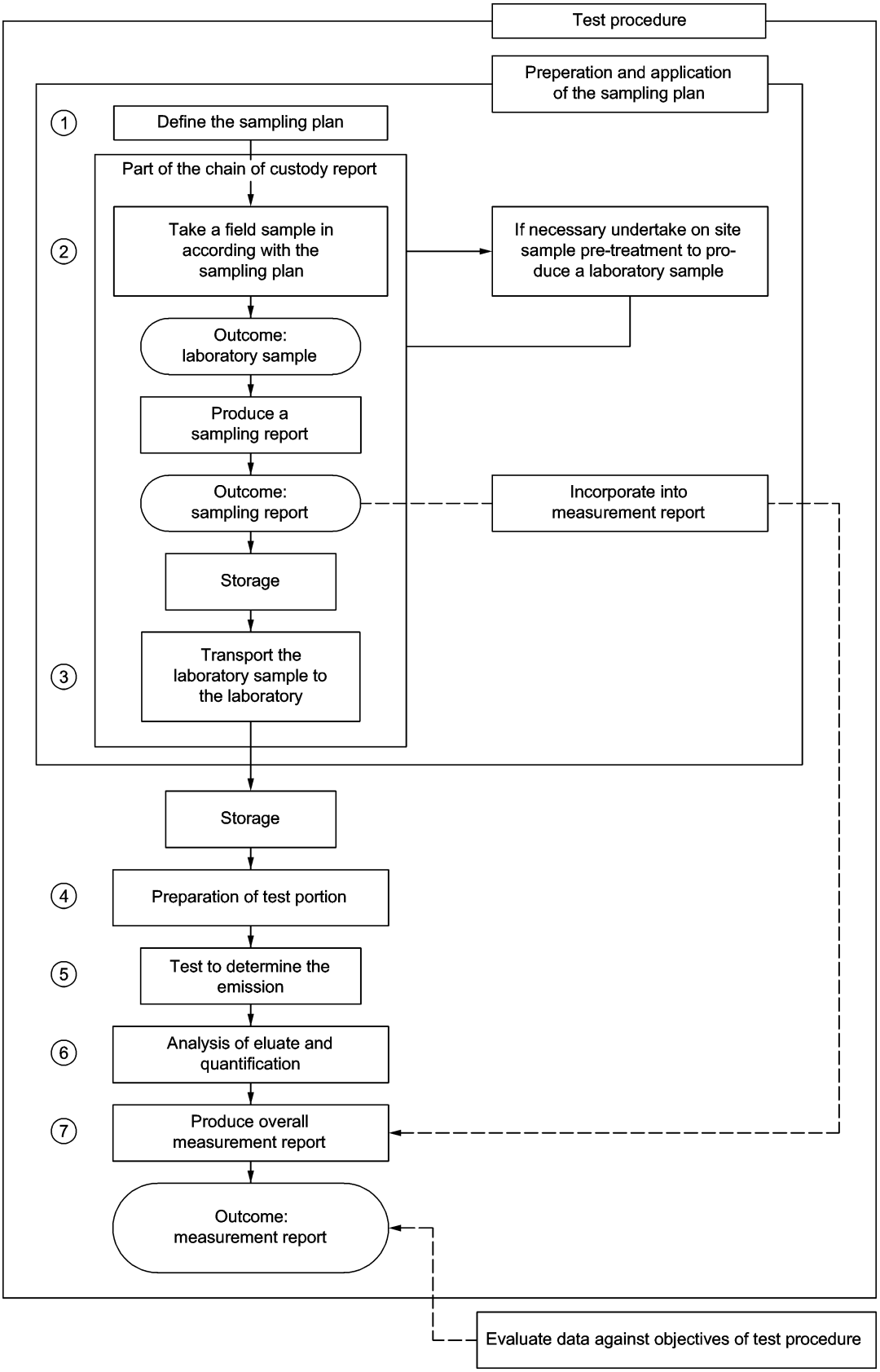



**Figure 2 — Links between the essential elements of a test procedure wherein the main steps are numbered (1 to 7)**

EXAMPLE When, for example, the release of dangerous substances from a construction product is strongly dependent on the presence of new surfaces, the sampling and subsequent preparation of the test portion should be such that no new surface is created or measures are to be taken to isolate new surfaces prior to testing.

NOTE 1 The preparation of the test portion might by itself consists of a number of steps.

NOTE 2 The preparation of the test portion is often referred to as “sample pre-treatment”, but in this Technical Specification that term is exclusively related to on site sample pre-treatment, aimed to obtain a representative laboratory sample of acceptable size.

## 6.2 Product sampling and transport to the laboratory

### 6.2.1 Introduction on sampling

(1) The essential elements for sampling of construction products to determine the release of dangerous substances are recalled in general terms in Annex C. This Annex C is therefore essential for a good understanding of this subclause 6.2 on sampling, as well as for the incorporation of release testing in the hEN or ETAs by CEN Technical Product Committees or EOTA WGs.

(2) It should be noted that this subclause 6.2 is dealing with sampling in a perspective of “complement to sampling” i.e. as a complement to sampling clauses in hEN or ETAs or in sampling standards dedicated to a family of products.

(3) It is the responsibility of the CEN Product Technical Committees to specify the detailed procedure for sampling. General requirements on sampling are provided in this Technical Specification as well as in CEN/TS 16637-2 and the percolation test under preparation that are based on CEN/TR 16220 [6].

### 6.2.2 Objective of sampling

(1) The objective of sampling a construction product is to obtain a sample or samples, in accordance with the specification of the required test portion. The sample(s) should represent the product as far as needed for the goal of the testing. Testing protocols drawn up in or for hEN and ETAs should allow for the modules in this clause, taking especially into account the fulfilling of the prerequisites for the test(s) to be performed (e.g. fitness for the determination of the release of dangerous substances into soil, surface water and groundwater).

(2) Care should be taken on sufficiently representativeness of the quantity of product being assessed; see C.1, C.2 and C.3.

### 6.2.3 Preparation of a sampling plan and sampling strategy

#### 6.2.3.1 General

(1) The development of a sampling plan prior to actual product sampling shall be included in the complete test procedures for assessing the release of Regulated Dangerous Substances into soil, surface water and groundwater. The topics addressed in this Technical Specification should be clearly set out in the sampling plan.

(2) Existing sampling plans for testing other product properties may not cover sufficiently the needs of testing releases from construction products of Regulated Dangerous Substances into soil, surface water and groundwater.

(3) For repetitive sampling, the same product at the same location, a single sampling plan can be developed which can be used each time when a sample is to be taken.

(4) A good understanding of the concepts for the key terms population, sub-population, scale, increment, composite sample and sample is essential for the development of a test procedure (see Figure 3 and the definitions in Clause 3, Annex C and Figure 2, on key elements for product sampling).

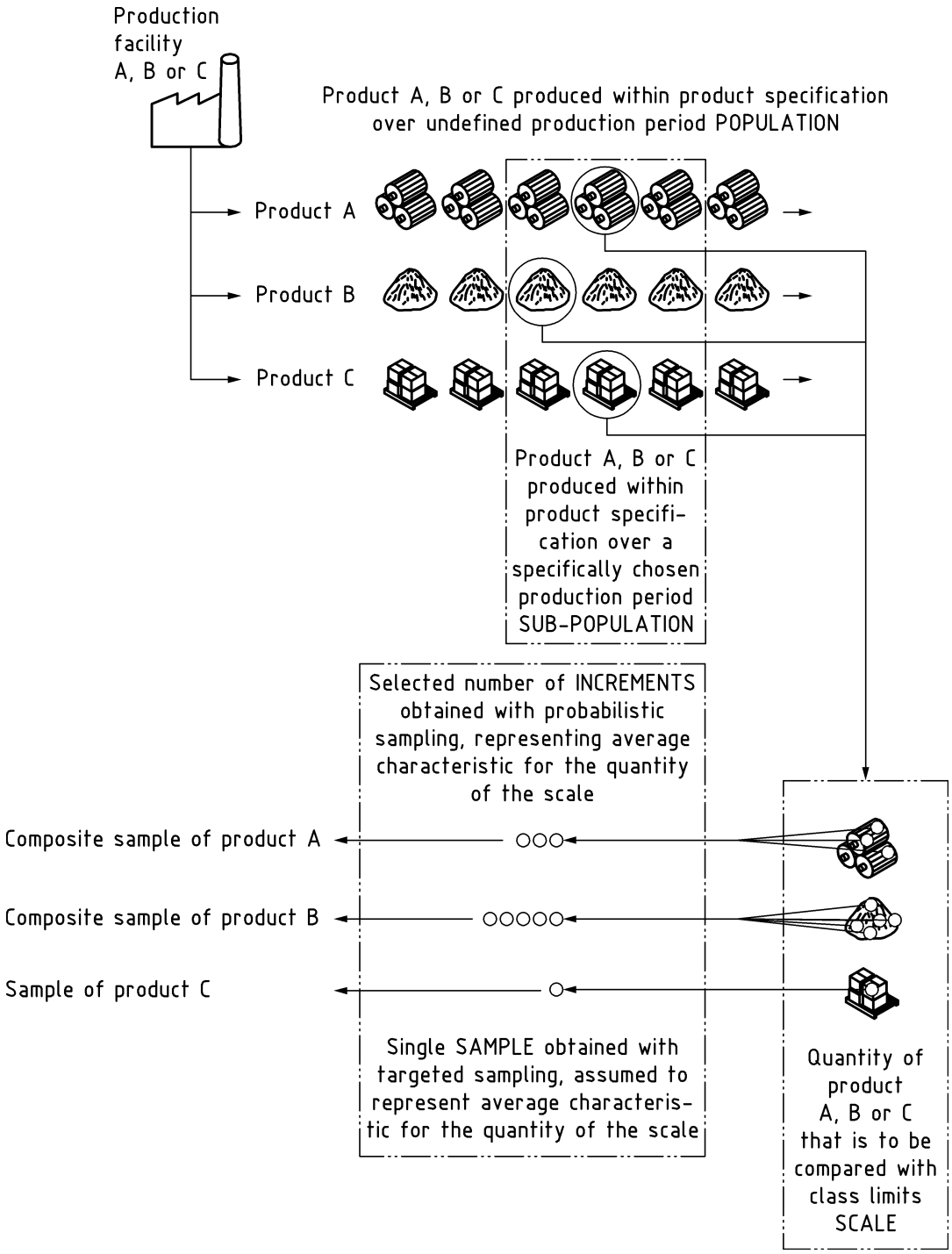



**Figure 3 — Illustration of the relations between the key terms of product sampling**

#### 6.2.3.2 Sampling approach

An informed decision shall be made on the sampling approach, either applying probabilistic sampling or judgmental (or informed) sampling.

NOTE An informed decision in this context means to balance the pros and cons of possible sampling approaches. This implies balancing the necessary effort and costs of sampling and the practical possibilities for sampling against the (statistical) representativity of the test result for the sampled sub-population and the objective of sampling. Obviously such an informed decision is only possible when detailed knowledge is available on the product to be sampled and the process that product originates from. Example: When sampling a moulded product for the release to soil, surface water and

groundwater it might be necessary to obtain a smaller part of the product due to the product size. Probabilistic sampling might be used for the random selection of the product from which a part is taken. However, in light of the influence new surfaces have on the release to soil, surface water and groundwater, at least the final selection of the part of the chosen product that is the sample, has to be an informed choice; taking a part with as small as possible new surface.

#### 6.2.3.3 Population and sub-population

For the determination of the release of Regulated Dangerous Substances the same approach for selection of the sub-population may be used as for sampling of products for testing of other properties according to product standards (EN). It should be noted however that an approach that works well for these other properties does not necessarily work for Regulated Dangerous Substances.

#### 6.2.3.4 Scale

(1) The scale (also called “lot”) to be used shall be specified in the relevant hEN or ETAs.

(2) In defining the scale for sampling, a practical (first) approach can be to use the same scale as is already used for the determination of other properties in the construction product. When applying that scale for the determination of the release of Regulated Dangerous Substances, it should be judged if the variability between the obtained results is limited to an acceptable level. If not, it might well be that the scale is set too small for obtaining a good representative sample for the release of Regulated Dangerous Substances into soil, surface water and groundwater, i.e. not necessarily securing a representative sample exhibiting an appropriate uncertainty (see Annex C).

#### 6.2.3.5 Size of samples, of increments when relevant and sampling techniques

(1) The samples specification (and when relevant increments) given in the hEN and ETAs specifying the product to be tested shall be used.

(2) The sampling techniques given in the hEN and ETAs specifying the product to be tested shall be used, especially the sampling techniques defined specifically for each type of products, taking into account:

a) the specification and the characteristics of the product to be sampled;

b) the minimum size of the sample(s) necessary for testing (and increments when relevant);

c) the measures necessary to maintain the integrity of the sample(s).

(3) Sampling activities shall have no, or as little as possible, impact on the integrity of the sampled product. This relates to minimizing:

a) the evaporation of volatile substances;

b) the creation of new surface, e.g. by cutting, unless this is necessary for obtaining a sample;

c) the deterioration of the product due to heat production during sampling or sub-sampling;

d) the contamination of the sample(s) by the sampling devices and/or the other sample(s).

(4) In case of dispute or potential doubt about the test results, it might be desirable to be able to provide a comparable test portion. Consequently, when the sampling strategy is to take account of this possibility, the minimum sample size should be such that it allows the production of at least three test specimens.

(5) The test portion can be a laboratory prepared product, which is prepared under procedures defined in the hEN or ETA specifying the product to be tested for the release of Regulated Dangerous Substances.

NOTE This applies in particular to products that are placed on the market in another form compared to intended use, e.g. tile adhesives. They are sampled in their supplied form, along with instructions in the relevant hENs or ETAs on how to prepare the test portion in the testing laboratory.

#### 6.2.3.6 Sampling of complex, composite and large products

(1) Samples of complex, composite and large products shall be taken and test portions shall be prepared for release testing in conformance with the specifications given in the hEN or ETA specifying the considered product.

(2) Complex, composite and large products are evaluated as a whole unit. For practical purpose the hEN or ETA specifying the considered product may foresee testing a model representing the whole product.

(3) As some products per definition are applied together with other products, this should be taken into account, specifically as the release of the product might be highly dependent on the combination of products.

NOTE This is needed so that the test portion can be defined and produced. This is also needed to relate the test result to the product(s) specified by the concerned CEN Technical Product Committees and EOTA WGs in their hEN and ETA.

#### 6.2.3.7 Sampling location and moment

(1) Product samples shall be collected at the point of manufacture after the normal manufacturing process. This may include curing time, drying time, etc. as stipulated in the hEN or ETA specifying the considered product.

NOTE The manufacturing process may include drying and curing periods if necessary before placement on the market.

(2) In defining the sampling location, a practical (first) approach can use the same location and time as used for other properties. It should be taken into consideration that the sampling requirements for determining the release of Regulated Dangerous Substances can be quite different from the sampling requirements for the determination of other properties (e.g. mechanical properties).

(3) Curing and conditioning are performed for many construction products before delivery from the producer facilities and/or before installation in the place of use. This is done in order to achieve the required properties such as mechanical properties. In case of intermittent exposure to water in the intended use, the CEN Technical Product Committee should adopt conditioning procedures in order to reach leaching properties such that the test could be performed as permanent contact, in order that possible alteration is taken into account. An example is given in CEN/TS 15119-1 [8].

### 6.2.4 Information from the testing laboratory needed to complement the product sampling plan

The following information shall be provided by the analytical laboratory to the sampling body for complementing the sampling plan:

a) number of product laboratory sample(s) needed for the testing programme (e.g. two product samples for testing and one for possible later review) ;

b) minimum and/or maximum size of product laboratory sample for testing;

c) instructions on packaging and transport, in particular with regards to effects of aging of the product (e.g. carbonation during storage).

### 6.2.5 Packaging and transport of laboratory sample

The following aspects shall be considered:

a) In order to avoid contamination, product samples shall be placed in air tight, release-free and absorption free packaging or containers.

b) Product samples that shall be examined separately shall be packed separately to avoid cross-contamination.

c) Samples of different products shall be packed separately.

d) If several solid product samples are packed together in one bag then it is essential to consider that the upper side and backing may show very different release levels. If then only one side shall be tested for release then it is important that product samples are packed in such a manner that there is no direct contact between back and front.

e) Product laboratory samples that are taken in a permeable commercial packing shall be wrapped additionally for ensuring airtight packaging to minimize risk of contamination. This does not apply to packing known to be impermeable such as metal cans, or laboratory bottles. Use of commercial packaging without further airtight wrapping is possible, especially for large products, if this is rated by CEN Technical Product Committees or EOTA WGs as being sufficient for testing purpose.

f) Liquids and powders/granulates shall be dispatched in a commercial can or bag, or in clean laboratory bottles made of glass or of polyethylene.

g) Excessive heat, extreme pressure and other physical challenges shall be avoided during storage and transport.

h) Contamination by adsorption of volatile chemicals from e.g. fuel cans, car exhausts gases, cleaners, during transport shall be avoided by proper packaging and by avoiding transport close to contamination sources such as gasoline canisters.

### 6.2.6 Sample description and marking of laboratory sample and sampling report

The following aspects shall be considered:

a) Marking of the sample shall not have any impact on release testing.

b) Solvent-free writing utensils may be used. Self-adhesive labels are suitable, which can be written on with a ballpoint pen and affixed as close as possible on the edge of the sample.

NOTE Examples are barcodes, ballpoint pens, pencils, self-adhesive labels.

c) The sample and the wrapping shall be marked identically.

d) Details of the client’s identification of the sample shall be included in the test report.

e) If available, a sampling report shall follow the sample. An example of a sampling report is given in Annex E.

### 6.2.7 Chain of custody report

The chain of custody form shall ensure that the product sample received in the laboratory is the same as the product sample taken in the field (traceability).

NOTE 1 It is good practice that the sampling plan specifies the completion of a chain of custody form for each sampling exercise, at the time of sampling.

NOTE 2 An example form for a chain of custody report is given Annex D.

#### 6.2.8 Dispatch of product samples, time schedule

The following aspects shall be considered:

a) Product samples shall be taken from the factory at the earliest point of time when the product is ready for dispatch to the construction site, or to other customers such as retailers. This point of time depends on the product types and information shall be given in the respective hEN or ETA.

b) The product sample shall be packaged, as specified above, as soon as possible after collection and, in any event, within the same working day.

c) The product sample shall arrive in the laboratory not later than NA days after the date of sampling. NA shall be specified by the relevant CEN Technical Product Committee EOTA WGs.

d) The maximum time between date of sampling and beginning of a test in the laboratory (including storage at manufacturer, transport, and storage at testing laboratory) shall be specified by the relevant CEN Technical Product Committee or EOTA WG.

#### 6.2.9 Report on sampling

The report on sampling comprises the following items:

a) definition of a sampling plan in view of the parameters to be assessed;

b) selection and justification of the sampling procedure;

c) selection and justification of the sample pre-treatment and storage of laboratory samples.

## 7 Indirect methods

### 7.1 Definition

Apart from horizontal reference methods (e.g. method in CEN/TS 16637-2, Clause 1 to Clause 11) also indirect methods exist. The term “indirect” method is variously applied to mean simplified method, secondary method, derived method or alternative method.

NOTE 1 Such “indirect” methods may be easier and/or cheaper to apply for a specific application. An indirect method is generally not horizontal but dedicated to a specific product or range of products (as specified in a hEN or in ETAs). Indirect tests aim at production control, and have the purpose to check whether a product (still) conforms with the behaviour of a reference product (tested with a type testing) and/or comply with regulations. Indirect tests focuse at specific (critical) parameters only, which have been determined previously by type testing. Because of its simplicity, conformity testing has practical and financial advantages. See Annex B for further details.

NOTE 2 The term “indirect” has been selected to underline that, instead of a direct determination by the horizontal reference method, an indirect method provides a result indirectly through the mandatory comparability, correlation or practical relationship to the reference method (in accordance with the purpose of the emission determination).

### 7.2 Requirements for indirect methods

(1) As indicated in the Introduction, one of the aims of this Technical Specification is – according to the horizontal concept specified in mandate M/366 – that construction products are evaluated under comparable conditions with regard to release to soil and water according to the horizontal concept specified in Mandate M/366 (see point IV-10).

(2) When applied to a specified product or range of products, an “indirect” method shall provide a result that is comparable to or correlates with that produced by the reference method.

(3) The requirements, especially the sampling requirements, specified for the reference method apply also for the “indirect” method unless this “indirect” method specifies different requirements adapted to its specific field of application.

(4) The specific and limited field of application of an “indirect” method may include requirements on raw materials, product formulation and operating parameters. In any event, the validity of the above correlation, comparability remains strictly in the field of application for which it has been established.

### 7.3 Examples of indirect methods

Examples of possible indirect methods:

a) content analysis to limit execution of release tests to substances with potential release above threshold levels;

b) batch tests according to EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4 ([8], [11], [12], [13]).

# Annex A
(informative)

# Release scenarios and impact assessment

## A.1 Release scenarios and test determination

(1) The point of departure for test determination is that the test methods should reflect the presumed dominant release mechanism in practice. On top of this principle, other (practical) arguments may play a role in test selection.

(2) Test determination (see main text) is based on general product properties (monolithic, granular, dimensional stability, hydraulic permeability) of the products as used during their “intended use”, and the predominant release mechanism as a result of these properties.

(3) The “release scenario” is of a descriptive nature, and reflects for a certain product category with the same general properties (i.e. impermeable, low permeable, permeable) the dominant release mechanisms expected in practice.

(4) Each release scenario corresponds to one or two associated test methods. The “release scenarios” presently defined are:

a) Scenario I: Impermeable product or product with low permeability

(1) Initial low or significant release by surface runoff, followed by low or significant release by mainly diffusion. Most of the water in contact with the product is redirected at the surface. Some water is present in the matrix or may be transported into the matrix pores by capillary forces. Once wetted, the transport of water stops, but the water allows substances to dissolve and to leave the product by diffusion through the water. At the surface substances may dissolve in the surrounding water or (partly) precipitate on the surface. This scenario is relevant for typical monolithic products used above ground, underground, or submerged into water (e.g. (glazed) tiles, bricks, concrete, large slags, and pipes).

(2) For monolithic granular products with low permeability water is transported into the matrix by capillary forces, most of the water in contact with the product will be redirected at the surface of the product. The water movement through the product is very slow. Release from the product will be dominated by diffusion, not by percolation. Due to the low permeability, a column test cannot be executed on such low permeable products. Dissolved substances are transported out of the matrix by diffusion. At the surface substances may dissolve in the surrounding water. This scenario is relevant for very fine products with very small pores, which may even react with water (e.g. some types of clay, bentonite, some fly ashes).

b) Scenario II: Permeable product

(1) Water may infiltrate into the matrix driven by gravity (pressure head gradient). A fraction of the water may be redirected at the surface of the product. The main transport process of substances is advection through the matrix with the gravity driven flow. Transport of substances with any water that is redirected at the surface is considered to be negligible. For example, granular products, aggregates from building debris, slags, soil, etc., used above ground or underground, or submerged into water.

**Table A.1 — Water contact and release scenarios for horizontal tests**

| Release scenario | | Test method related to scenario | Products (examples)[a] |
|---|---|---|---|
| I. | Impermeable product or product with low permeability; water is flowing over the surface of the product or transported into the matrix by capillary forces; contribution of core to surface leaching | Dynamic surface leaching test (DSLT) according to CEN/TS 16637-2:2014 (including a procedure for granular products with low hydraulic conductivity, see Annex A in CEN/TS 16637-2:2014) | coatings, ceramic tiles, glass, structural concrete, bricks, cement mortar, road materials, drainage tiles[b], bentonite |
| II. | Permeable product. Water may infiltrate into the matrix driven by gravity | Percolation test (PT) according to a Technical Specification to be prepared by CEN/TC 351/WG 1 | unbound aggregates, aggregates from building debris |

[a] It is possible for some generic type of products (e.g. coatings) that specific products will fall under different scenarios due to their characteristics. The selection of the scenario will be done by the respective CEN Technical Product Committee.

[b] Although products draining water have a high internal surface exposed to draining water, the situation may be rather comparable to that of a monolithic product. The surface area in contact with the water phase is much larger than the outer surface and can hardly be determined. These products are allocated to be tested by the DSLT test. CEN/TS 16637-2 includes further specifications on the declaration of the test results and on a proper use of these.

## A.2 Impact assessment and impact evaluation

### A.2.1 Source-pathway-target approach for impact assessment

(1) The choices to be made for “impact assessment” (such as the intended uses for which such criteria are established, time scale, distance of the “point of compliance”, etcetera) is a regulatory issue and not part of CEN/TC 351 work. Aside of the purpose of testing environmental properties of products and CE- marking, the test methods should also be the tools and starting point with which a consistent set of regulatory criteria can be made. The release scenario, as conceptual description of release processes, provides the lines along which all results from testing should be interpreted to enable estimates of the long term release in practice.

(2) For the whole process of “impact assessment”, for instance to derive regulatory release criteria, (Figure A.1), one needs a mathematical description of the release that describes the source term during specified intended uses, as starting point for a general “source-path-target approach” often followed in impact assessments. Therefore, the descriptive release scenario is coupled to a description of certain “intended uses” that are relevant to establish regulatory release criteria for impact evaluation and regulation. The quantitative conditions during intended use (e.g. rainfall in mm/year, temperature, dry-wet conditions, time, erosion) are called the “intended conditions of use”.

(3) Together with the test result, the intended use and the intended conditions of use can form the input for a mathematical (model) description of the actual release in practice. An estimate of the actual release in practice is called the “source term”, that forms the input for “modelling of environmental transport” of the substances.

### A.2.2 How to use “intended use” and “intended conditions of use”

(1) The release scenario is generic for products with the same general properties; the “intended use” and “intended conditions of use” are needed to provide a specific source term (Figure A.2), i.e. a mathematical description of the actual release in practice as a function of a specific intended use. Examples of specific intended uses that may require such a modelling step are:

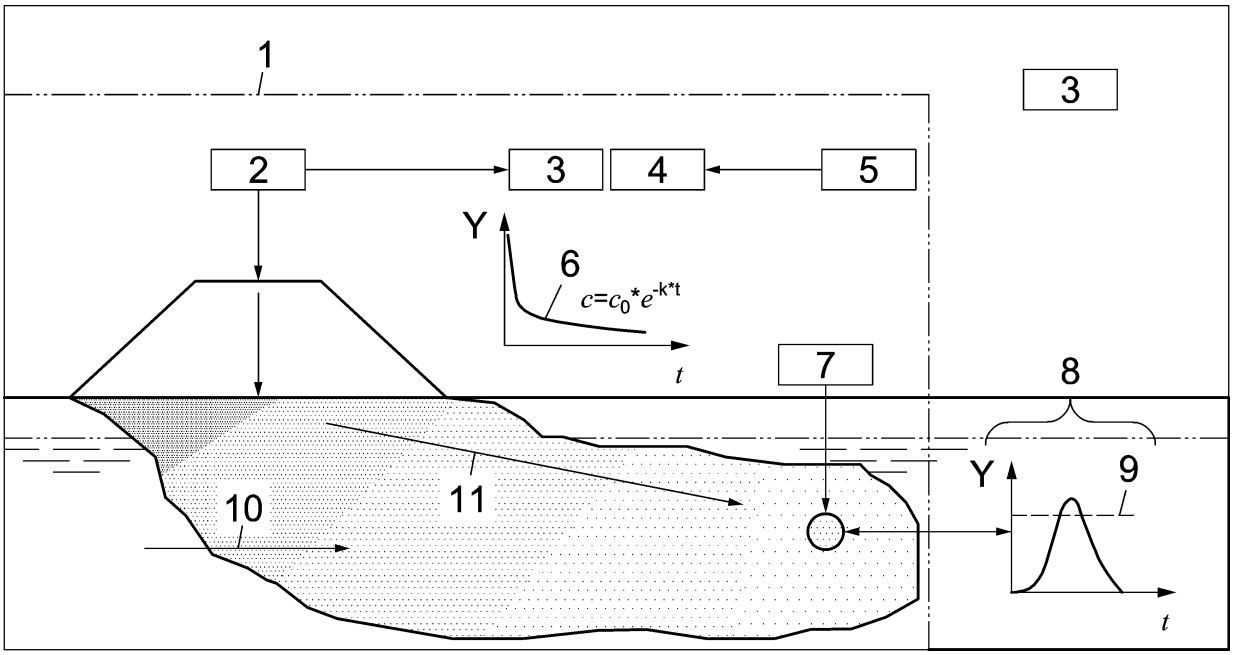
a) covered or uncovered applications, i.e. receiving the full net rainfall, or only a part;

b) completely submerged applications versus applications above (ground)water.

(2) The corresponding intended conditions of use include specifications of parameters such as the amount of water (mm/year), angle, temperature, etc., and all conditions that are needed to enable impact modelling. Impact modelling can also be used for the calculation of regulatory release criteria, that are tailored to specific and/or generic intended uses.

### A.2.3 Impact evaluation

While the “impact assessment” has as a result the environmental concentration of a substance, the impact evaluation is the comparison of this concentration with a (regulatory) limit value. The result of this comparison indicates if the product causes an environmental risk. For construction product tests, the predicted environmental concentration is calculated backwards to obtain a limit value in the eluate, which should not be exceeded by the product.




**Key**

| | | | |
|---|---|---|---|
| 1 | impact assessment | 8 | impact evaluation |
| 2 | intended use | 9 | protection level |
| 3 | intended conditions of use | 10 | groundwater flow |
| 4 | release and release mechanisms | 11 | modelling of environmental transport |
| 5 | release test | Y | concentration |
| 6 | source term | $t$ | time |
| 7 | point of compliance | | |

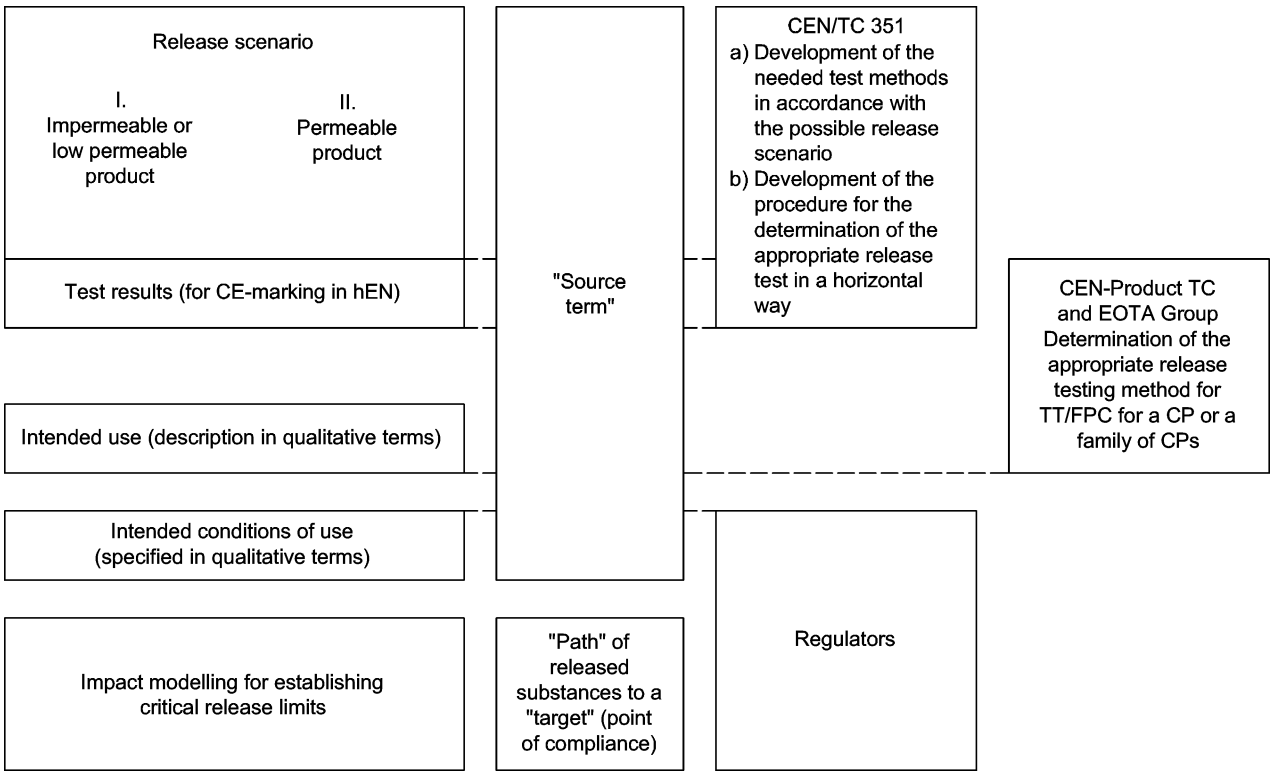
**Figure A.1 – Frame of the impact assessment and the impact evaluation**

## A.3 Responsibilities

a) CEN/TC 351 is responsible of establishing the appropriate release scenarios and development of the corresponding test methods.

b) The CEN Technical Product Committee is responsible for providing a qualitative description of the intended use of the product, and for providing the information to be used for CE marking, such as test results.

c) The regulator is responsible for development of a consistent set of release criteria, to be specified for specific intended conditions of use. To perform this, the regulator needs to define relevant intended conditions of use in quantitative terms, and to perform an impact assessment based on release scenario, test results, intended use and intended conditions of use.




NOTE The figure also shows the responsibilities of the different actors.

**Figure A.2 — Responsibility and interpretation of “release scenarios”, “intended conditions of use” and “impact modelling” to derive product release criteria**

# Annex B
(informative)

# Different types of leaching tests

## B.1 General

Different end-users of test methods (e.g. producers, regulators, scientists) have different questions that need to be answered. These questions may relate to a product's regulatory compliance, variability in its quality and long-term exposure under different conditions of use.

a) Depending on the type of question to be answered, there is a need for general applicable methods that provide process-level insight into the underlying release mechanism, as well as practicable, low-cost test methods for factory production control.

b) There is no single test method that can fulfil all of these needs.

c) An efficient approach is a framework that consists of different levels of (interrelated) test methods that include test methods that provide the necessary detail to identify the release controlling factors, and simplified tests, that are quicker, simpler and more cost-efficient for factory production control to the extent needed. Detailed information is also necessary for a later modelling of release or environmental impact.

## B.2 Reference tests and indirect test

(1) **Reference test**: One purpose of type tests is to function as a source for reference data against which data from conformity and quality control-level testing can be checked for consistency; but it also provides the release mechanism information needed for, e.g. long term environmental impact and product improvement. The use of type testing is limited to situations when the typical leaching behaviour of a broad range of substances is needed for identifying and understanding the leaching behaviour representative for a product. Typically, type testing needs to be conducted for a “new” product or product family. After an initial characterization of a product type, further testing usually might be reduced and factory production control can be limited to key parameters only, using shortened or indirect tests.

(2) **Indirect tests** aim at production control, and have the purpose to “check” whether a product (still) conforms with the behaviour of a reference product (tested with a type testing) and/or comply with regulations. Indirect tests focuses at specific (critical) parameters only, which have been determined previously by type testing. Because of its simplicity, indirect tests have practical and financial advantages.

(3) It is important to stress that the results of indirect tests cannot be judged on their own, but only in the context of the associated data from type testing on a (reference) product.

## B.3 Leaching tests for products with reducing properties

Granular products with a reducing character may exhibit a strongly different release behaviour after oxidation. Examples of such products are some slag types (e.g. air-cooled blast furnace slag) that will oxidize quickly during wet/dry cycle found in practice (e.g. when uncovered applied in parking lots). Whether the reducing character of a product will maintain intact in the intended use depends highly on the buffering capacity to oxidants in its environment. A test method to measure the “reducing capacity” is prEN 16660 (which is based on NEN 7348 [14]), a method based on cerimetry. In annexes to NEN 7348 [14], examples are given of products, reducing capacities and intended uses under which these products can be safely applied.

# Annex C
(informative)

# Key concepts for product sampling

NOTE This annex is taken from CEN/TR 16220 [6], and provides information on product sampling with regards to testing release of Regulated Dangerous Substances from construction products into soil, surface water and groundwater.

## C.1 Representativeness

(1) The ultimate goal of product sampling is obtaining a representative portion of the sampled construction product; maintaining the representativeness is essential in all steps where a (partial) sample of the product is involved. Whenever there is variability in the product, measures are to be taken in order to ensure the representativeness of the sample.

NOTE 1 When it comes to maintaining the representativeness of the sampled product, the full test procedure needs to be taken into account.

NOTE 2 The same set of samples can show a different distribution of test results for different properties.

(2) The degree of variability encountered, depends on the quantity of the product for which a sample is representative.

EXAMPLE A simple numerical example might be four tiles with a slightly different characteristic property, represented by single numbers. Observations are available for three series of four individual tiles:

| | | | | |
|---|---|---|---|---|
| **Series 1** | 3 | 7 | 5 | 9 |
| **Series 2** | 5 | 6 | 4 | 8 |
| **Series 3** | 2 | 1 | 5 | 7 |

The mean and standard deviation for these three series are:

— Series 1: mean 6,0 standard deviation 2,6
— Series 2: mean 5,8 standard deviation 1,7
— Series 3: mean 3,8 standard deviation 2,8

The overall mean and standard deviation are 5,2 and 2,4 respectively.

When, instead of individual tiles, a group of four tiles is tested in a single test, the mean values for these three series would become the new measurements. The standard deviation between these three measurements is decreased to 1,2 (instead of 2,4 when measuring all individual tiles). Using a bigger quantity of product (four tiles) reduces observed variability from 2,4 to 1,2. The results are less variable when a larger quantity of the product is tested. Consequently, the product might comply more easily.

(3) In order to obtain comparable test results, it is important that in a harmonized product standard a choice is made with respect to the quantity of product (the scale) on which that product is tested. See also C.6.4. Sampling might well result in a laboratory sample of 10 kg, while the size of the test portion can only be 1 kg. This implies that maintaining the representativeness of the sample is essential, in order to ensure that the test result of the 1 kg test portion indeed represents the original laboratory sample of 10 kg; as should the

laboratory sample of 10 kg actually be a representative portion of the original product. Maintaining representativeness throughout the whole test procedure, from the first stage of sampling until the actual testing, is therefore essential. The size of the test portion might put demands on the size of the laboratory sample, i.e. the laboratory sample should at least be sufficiently large to accommodate all test portions/test specimens necessary.

(4) Especially when determining the release into soil, surface water and groundwater, probabilistic sampling may result in less effective sample selection at higher costs than educated or skilled selection of samples. Such sampling is to be based on knowledge of the key parameters influencing release properties of a certain piece of sample. The release of dangerous substances across a certain amount of product often does not follow a statistically describable distribution, showing rather distinct changes depending on parameters such as actual composition, raw materials used, details of manufacturing process and storage conditions (e.g. temperature control, drying period), age of product and more.

NOTE 3 Some examples: Use of another source of tree may influence releases of a wood based product. Purchase of nominally identical resin or dispersion from a different supplier may influence release of a water-based adhesive. Changing to cement from another mill may influence release of a cement-based product. Slightly elevated temperature due to sunshine on the roof of a manufacturing plant may influence remaining volatiles in the final product.

(5) Additionally, incremental sampling shall be avoided when cutting is essential to obtain the individual increments, because the cutting edges creates fresh surfaces which potentially may disturb the release test result.

(6) Thirdly, products manufactured in a discontinuous manner are not always available as freshly manufactured products (although some products need aging before testing).

(7) Therefore, the alternative approach comprises a targeted and informed selection of sampling date and sampling site, such that the sampled product represents either typical release properties, or, worst case, elevated release properties, taking into account the availability of the product at the selected sampling site. In this approach, specific technological knowledge is used to ensure representativeness instead of statistical observations.

## C.2 Uncertainty

(1) The associated uncertainty of the final test result is of major importance when assessing the release of dangerous substances. The uncertainty is the result of variability in the obtained test result. Although often only one test result is obtained, that test result still is affected by the different sources of variability. When there is only one test result available, the variability is unknown; nevertheless, the test result is partly determined by that variability.

(2) Each activity necessary to obtain a test result has an effect on the variability and consequently on the uncertainty of that test result. Additionally, the variability of the product itself also contributes to the uncertainty. The sources of uncertainty of sampling are identified as:

a) variability in the product (over time and/or space);

b) variability introduced by sampling activities and all subsequent activities until delivery of the sample to the laboratory;

c) variability introduced by laboratory activities up to the reporting of the results.

(3) This text deals with the first two sources of variability.

(4) Sampling is at the very start of the assessment of a product. A series of subsequent steps is necessary to obtain the test result, based on which the actual assessment is performed. Starting at the end of that chain, the chemical analysis, and moving towards the first step of sampling, the quantification of the uncertainty associated with each of these individual steps become more and more difficult and costly. Consequently, it is

practically almost impossible to separate the uncertainty of sampling from the uncertainty of the subsequent steps.

(5) There is no specific level of uncertainty that can be considered as being acceptable. The acceptability of a certain degree of uncertainty depends on the risk of non-compliance. If the risk of non-compliance becomes too big, the overall uncertainty associated with the test result(s) should be smaller in order to still be able to come to a decision. The risk of non-compliance is determined by the “distance” of the obtained test result to the limit / limit value against which the product is assessed, and the variability of these test results (or potential test results if only one result is available). Thus, a relatively large degree of uncertainty is acceptable when the risk of non-compliance is low, while only a small amount of uncertainty is acceptable when there is a large risk of non-compliance.

## C.3 Sampling under various stages of production control

(1) CEN/TR 16220 [6], provides guidance to obtain a sample, either by a single sampling operation or by incremental sampling in which increments are joined into a composite sample. CEN/TR 16220 [6], provides guidance to ensure that the obtained (composite) sample is sufficiently representative for the quantity of product it represents.

NOTE 1 The user expects that a product according to a hEN or an ETA fulfils the specified requirements on the level of the individual product. While for consumer products, testing of each individual product might be an option, for environmental characteristics of construction products this is often not realistic.

NOTE 2 Repetitive sampling and subsequent assessment of a series of test results against limit values set by national authorities are highly related. CEN/TR 16220 [6], does not deal with the statistics necessary to determine whether a product complies with the limit values. As, at the time CEN/TR 16220 [6], was developed, no statistically defined objectives were set for determining if a test results complies, it is not possible to provide concrete guidance on the number of samples or test frequency necessary.

(2) Whenever repetitive sampling is applied, not only the representativeness of a sample for a chosen quantity of product is of importance, but also the variations that occur over time. These are the variations that occur on the level of the quantity for which a sample is representative (see also C.1). Consequently, the producer might be providing proof on the compliance of the product on a different quantity of product than the user expects. When making choices with respect to product sampling, this should be taken into consideration. The producer shall ensure that what is sampled is representative for the product that is to be assessed.

EXAMPLE A consumer, buying a bag of cement of 25 kg, assumes that this product fulfils the requirements. The consumer is unaware of the fact that the producer tests the product for quantities of for example 25 t. Consequently, there is a certain, undefined risk that the quantity bought by the consumer does in fact not meet the requirements. The producer should be aware of this when defining the sampling (and testing) procedure.

## C.4 Objective of sampling

(1) The objective of sampling a construction product is to obtain a sample in accordance with the specification of the test portion representing the product given in the hEN or ETA and that is:

a) sufficiently representative of the quantity of product being assessed, see C.3;

b) fulfils the prerequisites for the test(s) to be performed.

(2) See, with respect to being sufficiently representative, C.1 and C.2.

## C.5 Preparation of a sampling plan

(1) A sampling plan is to be completed prior to undertaking any product sampling.

(2) By providing specific and practical instructions, the sampling plan defines the boundaries and logistics of product sampling as part of the test procedure.

(3) The principles laid out in this annex can be used to produce a sampling plan for:

a) the development of a full horizontal test procedure as done in the present document (see Clause 5);

b) the development of a sampling standard or sampling instructions in a product standard by CEN Technical Product Committees or EOTA WGs (see Clause 6);

c) the production of standardized sampling plans for use under routine circumstances.

NOTE 1 The latter may be applied for example by an individual producer for application within the context of FPC.

(4) In the process of defining a sampling plan, the key steps of the test procedure (as shown in Figure C.2) are to be addressed. The definition process should:

a) identify those individuals and organisations with an interest and detail the proposed sampling design in agreement with the requirements as specified by those involved parties;

b) identify the requirements arising from other key steps in the test procedure;

c) establish specific instructions for when and where, and how many samples and/or increments should be taken;

d) identify all safety precautions that are to be taken.

NOTE 2 The specific details contained within any sampling plan differ according to the objectives of the test procedure, the product to be sampled and the sampling circumstances.

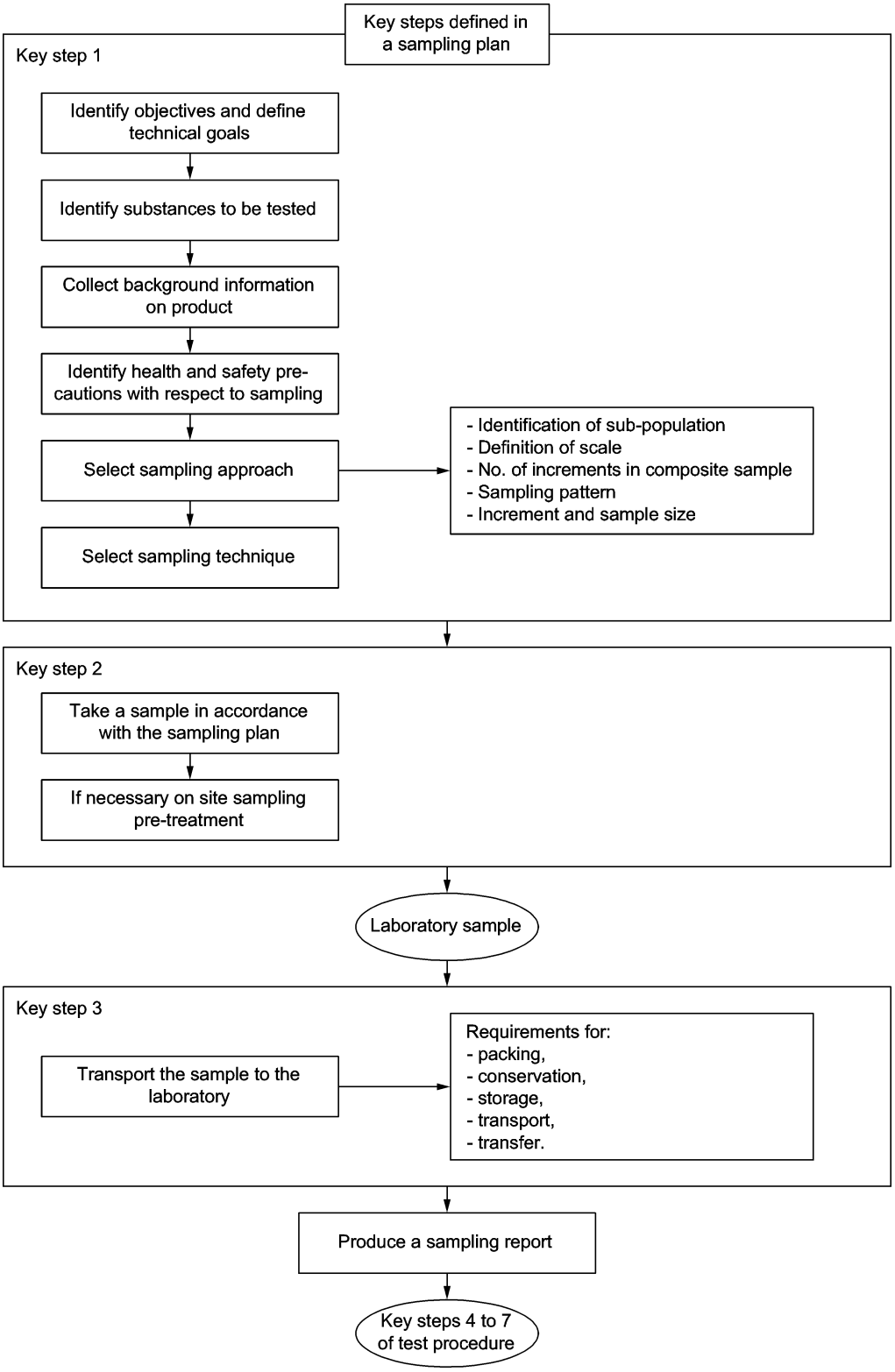



**Figure C.1 — Details on the key steps of product sampling**

## C.6 Considerations on sampling strategy

### C.6.1 General

General considerations taken from statistical observation techniques are helpful for specifying a sampling strategy for achieving representative test results.

NOTE 1 The term “sampling strategy” is used in other documents with different definitions. In this document the term “sampling strategy” relates to the aspects as referred to in the following subclauses: the sampling approach, population and sub-population, scale, increment and sample size and the sampling location and moment. In general terms, the sampling strategy takes account of the factors that determine what the sample is representative for, and how the representativeness of the sample is ensured.

NOTE 2 For a good understanding of the concepts in the next subclauses, also see the definitions in Clause 3.

### C.6.2 Sampling approach

(1) Two basically different approaches for sampling can be used:

a) probabilistic sampling, in which approach every item within the scale has an equal chance of being (part of) the sample;

b) judgemental sampling (or informed sampling), in which the selection of (an) item(s) within the scale that is (part of) the sample is based on knowledge about the product to be sampled and the process it originates from.

(2) Probabilistic sampling, wherein a random mechanism determines which items are part of the sample, should be preferred if insufficient knowledge on product and process is available, as only under the conditions of probabilistic sampling can sound statistical conclusions be applied to the obtained test results. However, when sufficient information is available, the quality of the results obtained with judgemental sampling can be the same as for probabilistic sampling.

(3) The term “judgemental sampling” covers a wide range of sampling approaches: from small deviations of a fully probabilistic approach, towards the judgemental selection of specifically identified items.

NOTE The use of judgemental sampling does not imply that the quality of sampling, and specifically the representativeness of the obtained sample, are insufficient. When for example the production process is well known, the specifically chosen item might by itself provide a good estimate of the characteristic of interest, while using probabilistic sampling would need a number of increments and/or samples to obtain a good estimate.

(4) When developing the sampling plan, an informed decision should be made on the sampling approach to be used. This choice is to be based on:

a) full understanding of the concepts of probabilistic and judgemental sampling;

b) the circumstances under which product sampling is to be performed;

c) the availability of detailed knowledge on the product to be sampled and the process it originates from;

d) the test(s) to be performed.

### C.6.3 Population and sub-population

(1) The term “population” is defined as the “totality of items under consideration”. A sub-population is defined as a “defined part of the population that is targeted for the purposes of sampling”.

(2) The quantity of products covered is defined as the sub-population.

(3) The sub-population is to be defined, taking into account:

a) the objective of testing;

b) the resources available;

c) the consequences of non-conformity;

d) the production process and the raw materials used.

NOTE 1 As each sub-population is, from the perspective of sampling and testing, seen as an entity, testing is necessary for each sub-population. Defining small sub-populations consequently implies a high sampling and testing effort for the population, and consequently a big demand on available resources. Opposite, when defining large sub-populations the financial consequences of non-conformity are high. Ultimately, the definition of the sub-populations is based on a balanced decision between costs of sampling and testing and the financial consequences of non-conformity.

NOTE 2 Whenever there is a possibility to link the definition of sub-populations to the production process, this can be done, as in general this allows the definition of sub-populations that in themselves are less variable in comparison to randomly defined sub-populations of the same size.

NOTE 3 Referring to the example in C.1, the three series from each of which four tiles are taken, would be three individual sub-populations.

(4) In specific cases, the sub-population might be defined as a group of related products, for which the release of dangerous substances is tested on the product that has the highest release potential within that group. If this specific product conforms, it might be assumed that all other products in that group also conform. Obviously, it is essential in such a situation that the assumptions on which the proof is based are sufficiently substantiated.

EXAMPLE A manufacturer produces autoclaved aerated concrete, with various product dimensions. The production is batch-wise, wherein the batch size is 2 t. Raw materials used in the production process are sand, lime, cement and gypsum in a constant mixture. Assuming a constant density of the products, the release of dangerous substances is basically independent of the dimensions of the individual products. To a minor degree, variations in the release relate to the batch in which a product is produced, but the major determining factor are variations in the raw materials. In this (somewhat simplified) example, the population covers all products produced with that same process. In the definition of a sub-population, account is taken of the fact that changes in the origin of the raw materials might have an impact on the release of dangerous substances. A sub-population therefore is defined as all products produces with a specific process using raw materials of specified sources.

### C.6.4 Scale

(1) The “scale” is a crucially important element in defining a test procedure. It defines the minimum quantity (mass or volume) of the product for which test results are obtained. Information on characteristics of the product, including release and variations therein, for a quantity of product smaller than the defined scale, is judged to be unimportant.

(2) The amount of variability in the population cannot be quantified without defining the scale on which that variability occurs.

(3) A given scale represents the quantity of product on which the measurement is based. Consequently, the mean value obtained for that scale is used to assess the construction product.

(4) It follows that when obtaining information about a product at the specified scale, each numerical value is a mean for the volume or mass of product at that scale.

(5) The scale should be fixed in the product standard. In establishing the scale, the following aspects should be taken into account:

a) the variability of the product;

b) the possibilities to obtain a smaller, but still representative, laboratory sample through on site sample pre-treatment;

c) the possibility to obtain a smaller, but still representative test portion;

d) the possibility to obtain a smaller, but still representative, laboratory sample through an informed decision on the place or moment of product sampling;

e) the costs of product sampling and when necessary subsequent on site sample pre-treatment;

f) the risk of non-compliance and the acceptability of that risk for both producer and consumer;

g) the practicalities of product sampling;

h) the possibility to obtain a representative sample for a (much) larger quantity of product.

(6) The scale should be fixed, independently of the level of testing (e.g. TT or FPC) performed on the product.

NOTE 1 The final quantity of product used for a test still has a certain mass (or volume). Assuming some variability even within this quantity of product, implies that the test result is a mean value, influenced by both highs and lows within that quantity. Consequently, all test results represent a mean value of a certain mass or volume, independent of the size of that mass or volume and independent of the degree of variability within that mass or volume.

NOTE 2 Quite often, the choice of scale is not consciously made and is just based on the amount of product that is practical for sampling or necessary for the tests to be performed. Be aware of the fact that such an implicit decision on the scale might result in high variability between results and consequently a larger chance of non-compliance of the product. Assessing the product on a larger scale is often beneficial (see Example 4 in this subclause). As a consequence, the size (mass or volume) of the laboratory sample is larger than the test portion necessary. On site sample pre-treatment of the obtained large sample or composite sample is necessary to obtain a representative laboratory sample. The onsite sample pretreatment, as well as the production of the test portion in the laboratory, has to ensure that the test portion is representative for the mean value of the large sample or composite sample. As such, it results in a much better estimate of the mean characteristic of the sub-population. A direct effect of this approach can be a lower sampling frequency.

NOTE 3 Choosing a too small scale leads to test results that do not sufficiently represent the product sampled. The variability is higher than what is expected.

NOTE 4 Fixing the scale in the product standard enables a level playing field in testing costs between different producers of the same product.

NOTE 5 If the scale would be fixed differently between TT and FPC, there is a considerable chance that the results of TT would no longer be representative for the results obtained through FPC.

EXAMPLE 1 Referring to the example in C.1, two different scales are used. In the situation where four individual tiles are taken from each of the three sub-populations, the scale is a single tile. Information on the release is obtained on the level of an individual tile. As the tile is the lowest quantity of product for which information is obtained, no information is available on the variability within an individual tile. In this example, this is considered to be unimportant.

(7) In the second part of the example, the four tiles from a sub-population are tested together. The scale has been enlarged to the quantity of four tiles. No information is obtained on a smaller quantity than four tiles and in this second part it is therefore assumed that this variation is unimportant. At the same time, as long as only one set of four tiles is obtained from a sub-population, there is no information available on the variability within the sub-population. The total number of tiles in the sub-population is far larger than four, so there is still a difference between the quantity of product to which the test result is directly related (four tiles) and the quantity of product that is assessed on the basis of that result (the sub-population).

(8) Finally, in the example in C.1 the results of the three sets of four tiles are compared to each other. In this situation, the scale is still a quantity of four tiles, but now the definition of the sub-population has changed. The

sub-population in the last part of the example is equal to the three sub-populations in the first part of the example.

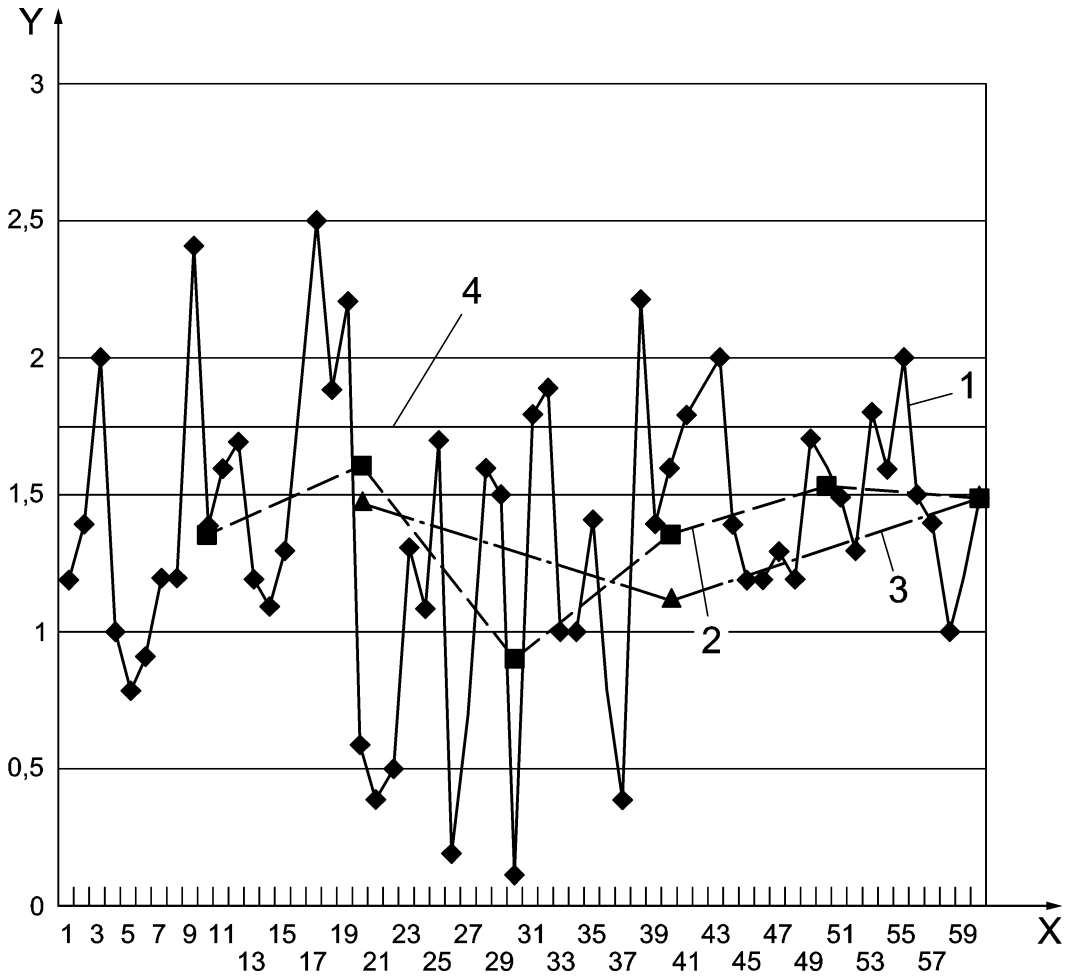
EXAMPLE 2 The variability in a product from gram to gram is likely to be larger than the variability in that same product from kilogram to kilogram. If variations on such a fine scale as grams are believed to be important, then that is the scale on which the sampling should operate. If, conversely, variations within any one kilogram of product are irrelevant, the primary aim of the product sampling should be to quantify variability solely on the kilogram-to-kilogram scale. It is therefore of vital importance that the scale is stated explicitly.

EXAMPLE 3 Let us assume that the test portion for testing a product is 1 kg. When the scale is not considered when defining the sampling plan, a sample is obtained of 1 kg. Variability between samples of 1 kg is substantially higher than variability on a scale of 1 000 kg. At the same time, it is not possible to take a 1 000 kg sample. Therefore the scale of 1 000 kg may be sampled by incremental sampling. The number of increments taken from the selected 1 000 kg needs to ensure that the resulting composite sample still provides a good estimate of the mean value for 1 000 kg. The number of increments necessary depends on the variability on the scale of the individual increments, for example 250 g, and the accepted uncertainty in the estimated mean value. Assuming this is fulfilled with 20 increments, the resulting composite sample is 5 kg. Preparation of the test portion in the laboratory then has to ensure the representativeness of a test portion of 1 kg from the composite sample. As the variability on the scale of 1 kg is substantially higher than the variability on the scale of 1 000 kg, the chance of non-compliance is substantially higher when using a (implicit) scale of 1 kg instead of a scale of 1 000 kg.

EXAMPLE 4 An evaluation of the risk on non- conformity is specifically important when there is a large difference between the quantity of product from which a (composite) sample is obtained, and the quantity of product that is usually applied by the consumer. Imagine a situation where there is a CEN Technical Product Committee for a specific type of floor covering. This CEN Technical Product Committee has chosen to set the scale at the median daily production of the involved producers, being 25 000 $m^2$. Consequently, the test result for the release represents the average release for a quantity of 25 000 $m^2$ with a test specimen size of 1 $m^2$.

(9) This type of floor covering is mainly used by private consumers, where the median quantity applied is 50 $m^2$. Obviously, it is the expectation of the consumer that the release of the product complies for the quantity that is used. Assuming little variability over the days production, a single randomly chosen part of 1 $m^2$ from that daily production has a release which is comparable to the release of any randomly chosen part of that day's production. In such a situation, the producer does not need to worry (too much) about the difference between the chosen scale (25 000 $m^2$), and the quantity of the product that is normally used (50 $m^2$). However, if a large degree of variability is to be expected over a day's production, there might be an unacceptably large chance that the product does not comply for a certain quantity of 50 $m^2$, despite the fact that the mean of the whole day does comply. Consequently, the producer might expect consumer complains. Apart from making changes to the process to enable a more stable quality of the product with respect to the release of Regulated Dangerous Substances, the CEN Technical Product Committee should also consider to define a smaller scale than which was originally chosen. By choosing a scale equal or comparable to the median quantity applied, the risk of consumer complains is far less. At the same time, test results clearly indicate the need to stabilize the production with respect to the release of Regulated Dangerous Substances.

EXAMPLE 5 When comparing test results of a relatively heterogeneous construction product with a given class limit, a well-chosen scale can have a significant effect on the conclusions with respect to (non-)compliance. In Figure C.2, the test results of a product over time are depicted. Tests have been performed with test specimens obtained from composite samples of 500 g. These composite samples were obtained from a product sampled over time on a scale of 100 kg, 1 000 kg and 2 000 kg. The cut off level for non-conformity is set at 1.75 and is shown as a horizontal line. It is obvious that due to variations in the product on a small scale (100 kg), the product frequently exceeds the level of non-conformity. Assuring the quality of the product on the market based on test for the 100 kg scale, would, in light of the considerable risk of non-conformity, imply high frequent testing and would consequently be expensive. However, when testing the same product on a larger scale of 1 000 kg, the product complies always. Consequently, the test frequency can be much lower. Finally, when looking at the product quality on a scale of 2 000 kg, there is little variability in the product, it lies well below the cut off and consequently a low test frequency is possible.




**Key**

X measurement

Y measured value (mg/kg)

**Figure C.2 — Results over time for a product tested at three different scales, 100 kg (1), 1 000 kg (2) and 2 000 kg (3), where the horizontal line (4) is the cut off for non conformity**

EXAMPLE 6 The manufacturer of autoclaved aerated concrete in Example 2 in C.6.3 defines the scale on which information on the sub-population is obtained as the amount of products produced during a single autoclave step. Given the production facility, this is a quantity of four batches of 20 t each.

### C.6.5 Size of increments and samples

(1) An increment is an individual portion of a 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.

NOTE 1 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 needs to fulfil both the criteria for the size of an increment as well as for a sample.

(2) A composite sample consists of two or more increments, put together in appropriate portions, from which the mean value of a desired characteristic may be obtained.

(3) Whenever the scale is larger than the quantity of product used in the test, measures should be taken to ensure the representativeness of the sample for the quantity of product at the chosen scale. When technically

possible, incremental sampling is an effective strategy to obtain a good estimate of the mean characteristic for the scale.

NOTE 2 The representativeness of the composite sample obtained directly depends on the variability of the product on the scale of the individual increments. In principle, variability on that small scale is considered to be unimportant as the chosen scale is (much) larger. However, when the variability on the scale of the increments is known, and the accepted level of uncertainty is defined, the number of increments that are to be combined in a composite sample can be calculated.

NOTE 3 Incremental sampling does not per definition imply mixing of the product. Given the example of C.1, an increment is an individual tile, while the composite sample consists of four individual tiles. When the quantity of product obtained in this way is suitable for the test, the full composite sample can be tested. Sub-sampling from the individual tiles might become necessary when the test specimen has the size of an individual tile. Then a quarter of each of the tiles can be obtained through sub-sampling when producing the test specimen.

NOTE 4 Except for granular products and small shaped products, incremental sampling normally is no option when determining the release into soil, surface water and groundwater. Cutting small pieces out of a larger product and later recombination in a composite sample cannot be used because the cut edges disturb the release test result.

(4) More details on the increment and sample size can be found in Annex C.

### C.6.6 Sampling of complex, composite and large products

(1) Samples of complex, composite and large products are taken and test portions are prepared for release testing in accordance with the specifications given in the hEN or ETA specifying the considered product.

(2) Complex, composite and large products are evaluated as whole unit. For practical purpose the hEN or ETA specifying the considered product may foresee testing a model representing the whole product.

(3) As some products per definition are applied together with other products, this should be taken into account, specifically as the release of the product might be highly dependent on the combination of products.

### C.6.7 Sampling location and moment

(1) Two different aspects are covered by “sampling location and moment”:

a) the definition of the location where and moment when a sample or individual increment is taken;

b) the definition of the locations where and moments when a series of samples is taken.

(2) CEN/TR 16220 [6] provides direct guidance on aspect a), while for aspect b) only limited guidance is provided. Apart from the variability within the sub-population on the predefined scale, the necessary number of samples directly relates to the requirements for the overall uncertainty of the test procedure.

NOTE 1 As the requirements for the overall uncertainty are not set at the time CEN/TR 16220 was prepared, the statistical testing is no part of CEN/TR 16220.

(3) CEN/TR 16220 [6] provides guidance on obtaining samples and increments (joint in a composite sample) which are sufficiently representative for the sub-population sampled. Detailed guidance on the calculation of the required number of increments and samples is provided in Annex C.

NOTE 2 Knowledge on the variability of a product, in light of defined choices about the sub-population to be tested and the scale on which these tests are to be performed, might be available for CEN Technical Product Committees or EOTA WGs. If this information is not yet available, it would be highly beneficial to obtain that information as this allows for informed decision on the cost effective testing of the product.

(4) Samples or increments should be taken from the factory as brought onto the market (ready for dispatch to distributors or users), as typical as possible for the total volume of production (the sub-population). Sample location and moment should be selected such that raw materials and production process are as typical as

possible with respect to the tested properties. Within these boundary conditions, samples or increments are to be taken based on random or stratified random sampling.

# Annex D
(informative)

# Example of a chain of custody report

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Chain of custody report | | | | | | | Reference no: | | |
| Site: | | | | File name: | | | | | |
| Start: | Date: | | Time | | File n° | | | | |
| End | Date: | | Time: | | Person in charge: | | | | |
| Samplers initials: | | | | | Other specifications: | | | | |
| | | | | | | | | | |
| Sampling report reference no: | | | | | | | | | |
| Sample no start: | | | Total no of samples: | | | | | | |
| Sample no end: | | | Laboratory: | | | | | | |
| Sample ID: | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Handed over between: | | | Time: | | Justification: | | Conditions: | | |
| | | | | | | | | | |
| Handed over by: | Initials: | | | | | | | | |
| | Signature: | | | | | | | | |
| Handed over by: | Initials: | | | | | | | | |
| | Signature: | | | | | | | | |

# Annex E
(informative)

# Example of a sampling report

<table>
<tr><td colspan="2">Testing laboratory/inspection body:</td><td colspan="3">Sampler (Name, company, telephone):</td></tr>
<tr><td colspan="2">Name of the manufacturer at the place of sampling<br>(address/stamp):</td><td colspan="3">Manufacturer (if deviating from company's name at the place of sampling):</td></tr>
<tr><td colspan="2">Name of the product:</td><td colspan="3">Type of product*</td></tr>
<tr><td colspan="2">Model/program/series:</td><td colspan="3">Batch No:</td></tr>
<tr><td colspan="2">Article No:<br>Misc.</td><td colspan="3">Date of batch production:</td></tr>
<tr><td rowspan="2">Sample is taken from</td><td>Production<br>Store<br>Miscellaneous</td><td rowspan="2">How had the product been stored prior to sampling?</td><td colspan="2">open<br>in the stack<br>wrapped up</td></tr>
<tr><td>Place of storage:</td><td colspan="2">Packing material:</td></tr>
<tr><td colspan="5">Specifics (possible negative influences by release at the place of taking the sample, petrol emissions, solvent emissions from production, uncertainties, questions, etc.</td></tr>
<tr><td colspan="5">Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the release test)</td></tr>
<tr><td colspan="5">Confirmation<br>The signer herewith confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of samples.</td></tr>
<tr><td>Date:</td><td colspan="4">Signature:<br>(Stamp)</td></tr>
</table>

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