CEN-CENELEC GUIDE 33

Guide for addressing environmental issues in testing standards

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CEN and CENELEC decided to adopt this CEN-CENELEC Guide 33 through decision BT C166/2015.

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European foreword

CEN and CENELEC develop European Standards (EN) and other publications, including Technical Specifications (TS), Technical Reports (TR) and Workshop Agreements (CWA). The European Standardization System has made a significant contribution to the creation of a common European market, embedded in a global economy, and in disseminating the knowledge incorporated in these publications through its network of CEN and CENELEC (national) Members.

CEN and CENELEC developed this Guide to provide guidance on addressing environmental impacts of European standardization documents related to testing.

This Guide complements the already existing CEN Guide 4 'Guide for addressing environmental issues in product standards'.

This CEN/CENELEC Guide on testing standards has been prepared by a subgroup of CEN/SABE/ENIS-Team "Products and services: Environmental Issues in Standardization" with the participation of CLC/TC 111X 'Environment' under the supervision of CEN and CENELEC Technical Boards.

Further help for addressing environmental aspects in standards is available at the CEN Environmental Helpdesk (CEN/EHD) which can be contacted through http://www.cen.eu/CEN/services/ehd, and the CEN-CENELEC website.

Introduction

This Guide is intended for use by standard writers involved in drafting and revision of testing standards to raise the awareness of environmental impacts of testing standards.

Similarly to product standards addressing the environmental impact of products, testing standards should also address the environmental impacts of testing.

Standard writers are encouraged to:

— identify and understand basic environmental aspects and impacts related to testing;

— determine when environmental aspects need to be addressed in a testing standard.

1 Scope

This Guide gives guidance about environmental improvement of testing processes described in testing standards. The intention of this Guide is to reduce the environmental impact of testing by providing guidance on how to address environmental issues in testing standards.

This Guide is only applicable to the testing procedure. This Guide does not describe how sampling should be done. It should help to identify environmental impacts of sampling where it is necessary.

The following is excluded from the scope:

— the general operating conditions of laboratories unless specified as part of the test;

— the life cycle of testing equipment;

NOTE 1 Testing equipment is regarded as a product. For environmental issues of products see CEN Guide 4.

— testing that is part of the production process;

NOTE 2 Testing that is part of the production process (for example functional or quality testing) is already considered under CEN Guide 4.

— the environmental impact of test reports (e.g. use of paper, on which the report is written).

Environmental improvement of the product to be tested is not considered in this Guide but in CEN Guide 4.

Climate change considerations are not part of this document and are dealt with in the "CEN/CENELEC Guide for addressing climate change adaptation in standards".

Workers protection and Occupational health and safety conditions are out of scope of this Guide.

2 Terms and definitions

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

2.1
product
any goods or service

[SOURCE: EN ISO 14050:2010, 6.2, modified — The Notes to the original definition are not mentioned here.]

2.2
item under test
product, material, substance or characteristics of the environment being evaluated

Note 1 to entry: EN ISO 14001 defines environment as surroundings in which an organization operates including air, water, land, natural resources, flora, fauna, humans and their interrelationships.

EXAMPLE Manufactured product, environmental media (soil, water, air), noise, vibration.

2.3
testing standard
standard that is concerned with test methods, sometimes supplemented with other provisions related to testing, such as sampling, use of statistical methods, sequence of tests

[SOURCE: ISO/IEC Guide 2:2004, 5.3]

2.4
test
determination of one or more characteristics according to a procedure

[SOURCE: EN ISO 9000:2005, 3.8.3]

2.5
sample
subset of a population that is collected in order to estimate the properties of the underlying population

[SOURCE: ISO 3534-1:2006, 1.3, modified — The original definition was consistently redrafted.]

2.6
testing agent
substance or mixture applied to a sample in view of its preparation or its analysis

2.7
standard writer
person taking part in the preparation of standards

[SOURCE: CEN Guide 4:2008, 2.12]

2.8
life-cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to final disposal

[SOURCE: EN ISO 14050:2010, 7.1]

Note 1 to entry: The term “product system” is defined and further explained in EN ISO 14040.

2.9
testing environmental impact
change to the environment whether adverse or beneficial, wholly or partly resulting from environmental aspects of a test method

[SOURCE: EN ISO 14001:2015, 3.2.4, modified — The original term was "environmental impact", the segment "an organization's" was removed and "of a test method" was added.]

2.10
product standard
standard that specifies requirements to be fulfilled by a product or group of products, to establish its fitness for purpose

Note 1 to entry: A product standard may include in addition to the fitness for purpose requirements, directly or by reference, aspects such as terminology, sampling, testing, packaging and labelling and, sometimes, processing requirements.

Note 2 to entry: A product standard can either be complete or not, according to whether it specifies all or only a part of the necessary requirements. In this respect, one may differentiate between standards such as dimensional, material, and technical delivery standards.

[SOURCE: ISO/IEC Guide 2:2004, 5.4]

3 General

CEN Guide 4 primarily addresses product standards (including service standards). Large parts of it can be readily applied to testing standards such as the basic principles and approaches in Clause 3 and the description of environmental aspects in clause 4. This guide provides specific guidance for testing standards.

Testing is carried out at several points of a product's life cycle. Testing is also applied for other purposes (see examples of different types of testing below).

Examples of different types of testing are:

— analytical testing;

— fire resistance testing;

— mechanical/physical testing (e.g. compression, pressure, temperature, humidity);

— microbiological testing;

— electrical testing;

— visual inspection.

Testing standards should address environmental impacts of the testing.

Testing standards should describe tolerances and required level of accuracy, reliability and repeatability, taking into account feasibility, affordability and environmental impact of the selected option.

NOTE 1 This is to allow selection of the least impactful sampling, sample preparation, test, test equipment and disposal, e.g. in respect to minimizing harmful substances to be used and still meeting tolerances and required level of accuracy, reliability and repeatability or other quality attributes.

NOTE 2 Calibration of testing equipment is a necessary prerequisite to understand the limitations of testing equipment.

Testing standards should take into account the environmental impacts of the usage of the item under test during the test as well as the environmental impacts of the usage of test equipment or environmental conditions specified by the test method.

EXAMPLE Fuel consumption of a car during test cycles required for carrying out the testing.

Furthermore, automation in sampling, sample preparation and testing can reduce human exposure to toxic, carcinogenic or otherwise harmful effects, and can reduce human error which might lead to a higher risk of harmful emissions to the environment or a higher risk of the tests having to be repeated, causing additional exposures/emissions.

A balance between those potential impacts because of manual procedures on the one side and impacts from (additional) energy and consumables use because of automation on the other side is desired.

Workers protection and Occupational health and safety are out of scope of this Guide. However, standard writers should be aware that national labour laws and other laws on Occupational health and safety may prevent some test methods or impose conditions under which they are performed.

Strategies for environmental improvements are (where applicable):

— selecting the test method: choose the best option in case of alternative methods;

— replacement of actual tests by simulation or application of mathematical models;

— consider balance between in-situ and lab-testing;

— apply statistical processes to ensure quality instead of sample testing;

— use non-destructive testing, when possible;

— use gravimetric instead of volumetric methods;

— consider resource efficiency aspects, for example sample size in destructive testing;

— staff training on environmental issues of tests;

— optimize testing conditions to reduce one or more of the following elements: sample size, test duration, test intensity, consumption of test agents, consumption of energy, etc.

Examples of relevant legislation and guidance documents are given in Annex B.

4 Stages of testing

Testing can normally be subdivided in four stages. The stages of testing are:

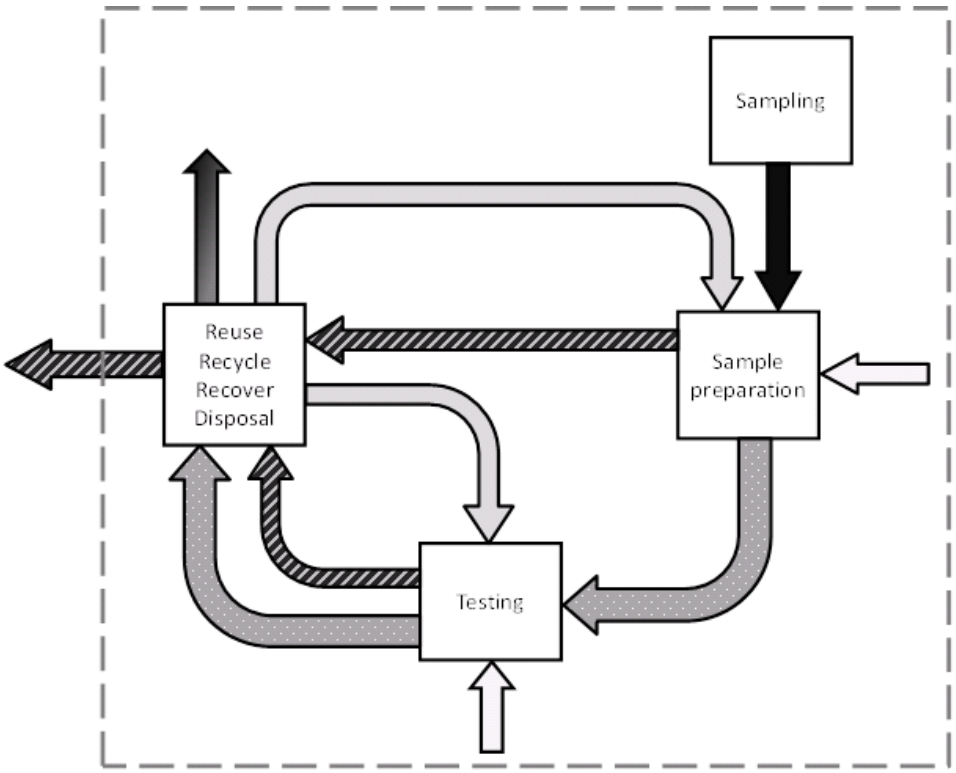
— sampling;

— preparation of a representative sample (including mixing of sample and storage of sample), testing materials (testing agents, standard solutions) and equipment (calibration, commissioning);

— test;

— reuse, recycling, recover or disposal of sample, testing agents and consumables.

An illustration of the four stages of testing as part of a cycle is given in Figure 1.



Key

- fresh sample
- reused/recycled/recovered sample
- prepared and/or tested sample
- fresh reagent/energy/consumables
- reused/recycled/recovered reagent/energy/consumables
- preparation and/or testing residues
- scope of this guide

Figure 1 — Stages of testing

5 Environmental considerations on testing

5.1 Sampling

Examples for environmental improvement of sampling are:

— avoiding sampling by direct measurement/on-line monitoring (e.g. pH testing in-situ instead of sampling and lab-testing);

EXAMPLE Direct measurement, using an electrode, may have less environmental impact considering the samples transport, and consumption of consumables or reagents necessary to perform the test in a laboratory.

— reduction of sample size in order to reduce amount of waste, chemicals, energy, etc.;

NOTE The reduction of the sample size could influence the characteristics of the sample or adversely affect the test accuracy, reliability or repeatability.

— sampling with minimum impact on the environment (e.g. combination of multiple sample collections in one trip);

— select appropriate tools and containers to ensure the quality of the sample with minimum environmental impact.

5.2 Preparing the test

Examples for environmental improvement of sample preparation are:

— promote the most environmental friendly storage and preservation method;

— reduce sample preparation size;

EXAMPLE 1 For liquids use gravimetric instead of volumetric determination of volumes. Measuring the amount of a liquid with a high vapour pressure the minimum volume is limited because of the high vapour pressure.

— reduce storage time;

— select low impact testing agents;

— reduce impacts of testing agents by reuse or recycling;

— in some situations homogenization of samples might reduce the amount of the tests, as it ensures representativeness;

EXAMPLE 2 Sampling of an area of soil or waste.

— minimize emissions and spillages.

5.3 Test

Test methods and procedures should consider their environmental impact and their possibilities of improvements.

Examples for environmental improvement that testing standards should consider:

— reduce amount of testing agents;

EXAMPLE 1 For liquids use gravimetric instead of volumetric determination of volumes.

— reuse, recycling or recovery of testing agents;

— selection of testing agents with minimum environmental impact;

— minimize spillages of testing agents;

— reduction of the test duration in order to reduce energy consumption in energy using tests;

— reusable testing equipment, accessories and consumables;

EXAMPLE 2 Use reusable/recyclable test kits.

— reduction of emissions (chemicals, smoke, dust, heat, noise, CO_2, etc.) by improving the efficiency of tests and use the most efficient testing equipment;

— try to assess multiple parameters in one test.

5.4 Reuse, recycling, recover or disposal of sample, testing agents and consumables

At the end of the test the environmental impact and the possibility of improvements through reuse, recycling or recovery of samples, testing agents and consumables should be considered.

Examples for environmental improvement that testing standards should consider:

— separate waste streams to promote easier reuse, recycling, recovery or disposal;

— reuse, recycle or recover samples or testing agents and equipment;

— avoiding the release of substances with adverse effects on health or the environment;

— neutralizing testing agents for disposal (e.g. pH-value);

— minimizing the ability of the agents to react;

— cleaning of testing area.

NOTE Disposal and cleaning only refers to the operation directly related to sampling, preparation, testing and disposal with regards to the testing standard, e.g. not the overall cleaning of the site or general management of waste streams at a site.

Good laboratory practice (GLP) should be respected, e.g. disposal of harmful chemicals should be minimized in accordance with discharge permits.

5.5 Environmental checklist for testing standards

The purpose of the environmental checklist template (see Table 1) is to assess whether the proposed testing standard covers relevant environmental aspects of testing and, if so, how they are dealt with in the draft. The environmental checklist may be adapted before use. The checklist should be completed, updated as appropriate and attached to drafts of a standard.

The environmental checklist could be published as an appendix of the standard.

In case of alternative test methods one checklist may be completed for each method, to evaluate and select the best method.

The following steps should be followed, when filling out the environmental checklist template:

— identify each environmental aspect and adapt the template if necessary;

— fill in each box with "yes", if there is a significant environmental aspect of the testing described, or "no" if there is no significant environmental aspects or if the box is not relevant;

— in each box with a "yes", identify whether this environmental aspect of testing can be addressed in the standard and mark these boxes;

— write the numbers of the clauses in the standard, where the environmental aspects of testing are addressed, in the appropriate boxes;

— use a separate box ("Comments") to provide additional information.

NOTE A short description of each environmental aspect of testing (boxes marked with "yes") and how they are addressed (or why not) can be given here. Furthermore, environmentally related comments on the draft standard and the TC reply to these comments may be given here.

When addressing various environmental aspects during the testing life cycle, it needs to be borne in mind that environmental burden should not be shifted from one life-cycle to another, or from one medium to another. The developer of the testing standard should take a holistic life-cycle view and assess all stages and impacts and make an informed decision for the best option. In this regard, the level of accuracy, reliability and repeatability and scope of the testing standard should be defined such as to match the desired quality.

While limiting the environmental impacts of product testing, it should still be ensured all relevant conditions and configurations are appropriately tested. Otherwise negative environmental impacts from a failure of the product may be disproportionately higher compared to the reductions made on tests or tests in production monitoring.

Table 1 — Environmental checklist for testing standards

Document number (if available):	Title of standard:	TC/SC/WG number:
Work item number (if available):	Version of the environmental checklist:	Date of last modification of the environmental checklist:

Environmental aspect	**Stages of testing**			
	Sampling	**Preparing the test**	**Test**	**Reuse, recycling, recover or disposal of sample, testing agents and consumables**

	Product sample	**Sample from the environment (e.g. soil, water)**	**Physical preparation of the sample**	**Preparation of testing agents and materials**	**Application of testing agents/material**	**Item under test**	**Use/cleaning of testing equipment**	**Use of testing agents**	**Use of consumables**	**Reuse**	**Recycling/ Recovery**	**Disposal**
Inputs												
Materials												
Water												
Energy												
Land use												
outputs												
Emissions to air												
Discharges to water												
Discharges to soil												
Waste												
Reusable or recovered materials												
Noise, vibration, radiation, heat												
Other relevant aspects												
Risk to the environment from accidents or unintended use												
Comments:												

When significant environmental aspects of testing have been identified using the environmental checklist template, environmental provisions can be drafted for each of these aspects. Clause 5 and Annex A contain specific guidance and examples that can be correlated to the checklist.

Annex A
(informative)

Examples for consideration of environmental issues in testing standards

A.1 Examples related to the stages of testing

A.1.1 Description of the issue

A guideline on how the stages of testing can be environmentally improved may be given in standards. These recommendations can be sector specific.

A.1.2 Example – EN 14717 "Welding and allied processes — Environmental check list"

EN 14717:2005 provides general recommendations on which aspects to consider during testing, especially:

— EN 14717:2005, Table 6 – Inspection and testing;

— EN 14717:2005, Table 7 – Destructive testing.

Furthermore, EN 14717:2005, Table A.1 recommends actions to reduce the environmental impact, especially:

— chemicals used;

— cleaning agents;

— scrap.

A.1.3 Examples - Directive 76/211/EEC Making-up by weight or by volume of certain prepackaged products

Annex II explicitly outlines the preference for non-destructive testing and respective guidance for selecting the appropriate method:

"For each of these checks, there are two sampling plans:

— one for non-destructive testing, i.e., testing which does not involve opening the package;

— the other for destructive testing, i.e., testing which involves opening or destroying the package.

For economic and practical reasons, the latter test shall be limited to the absolutely essential minimum; it is less effective than the non-destructive test.

Destructive testing shall therefore be used only when non-destructive testing is impracticable. As a general rule it shall not be applied to batches of fewer than 100 units."

A.2 Examples related to the substitution of testing agents

A.2.1 Description of the issue

Substitution of environmentally harmful testing agents causes less harm to the environment by the test method.

A.2.2 Example – ISO 17403 "Rubber — Determination of magnesium content of field and concentrated natural rubber latices by titration (cyanide-free method)"

ISO 17403 introduces new environmentally friendlier methods for the determination of magnesium content in natural rubber latex. These new methods are cyanide-free. The new methods use sulphide ions (as NaHS) for testing, which is 3 times less toxic than cyanide. If calcium carbonate or calcium hydroxide is added before testing, the formation of sulfide gases can also be prevented.

A.3 Examples related to the reduction of amounts of testing agents

A.3.1 Description of the issue

Reduction of the used amounts of environmentally harmful testing agents causes less harm to the environment by the test method.

A.3.2 Example – EN 16174 – Determination of content of inorganic dangerous substances in construction products

In EN 16174 the choice was made to focus on aqua regia digestion instead of full digestion of any construction product matrix by using HF. The fraction of substances that is tied up in the matrix and cannot be extracted by aqua regia can hardly be considered of environmental relevance. Within the protocol two options are provided. A reflux method using larger sample volumes (and thus larger acid consumption) and a microwave method, which requires more sample pre-treatment to obtain a representative small test portion and therefore uses much less acid. The laboratory analyst can opt for the method with less acid use.

A.4 Examples related to the reduction of testing based on statistics

A.4.1 Description of the issue

Reduction of the number of tests can be obtained by making use of information obtained earlier. In particular, results of earlier tests can be used to reduce testing frequency. Also, existing information on content, characteristics and test results of products can result in Without Testing of Without Further Testing approaches, comparable to these instruments under the Construction Products Regulation.

A.4.2 Example - CEN/TR 16797 series – Guidance on the statistical assessment of declared values

This Technical Report describes a statistical approach based on earlier test results and the deviation from the limit value to interpret a new test result and to define test frequency. If subsequent test results are known, outliers may be defined. Consecutive test results far under the limit values may support a decision for a lower frequency of testing.

Annex B
(informative)

Examples of relevant legislation and guidance documents

Montreal Protocol on Substances that Deplete the Ozone Layer [UN]
(http://ozone.unep.org/pdfs/Montreal-Protocol2000.pdf)

Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer

Regulation (EC) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006

Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions; Roadmap to a Resource Efficient Europe (http://ec.europa.eu/food/safety/food_waste/library/docs/com2011_571_en.pdf)

Directive 2004/9/EC of the European Parliament and of the Council of 11 February 2004 on the inspection and verification of good laboratory practice (GLP)

(http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:050:0028:0043:EN:PDF)

Directive 2004/10/EC of the European Parliament and of the Council of 11 February 2004 on the harmonisation of laws, regulations and administrative provisions relating to the application of the principles of good laboratory practice and the verification of their applications for tests on chemical substances

(http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:050:0044:0059:EN:PDF)

CEN Guide 13, *Validation of environmental test methods*

ISO Guide 64, *Guide for addressing environmental issues in product standards*

IEC Guide 109, *Environmental aspects — Inclusion in electrotechnical product standards*

Website about good measuring practice (http://www.goodmeasuringpractice.com/)

Bibliography

[1] CEN Guide 4:2008, *Guide for addressing environmental issues in product standards*

[2] EN 14717:2005, *Welding and allied processes — Environmental check list*

[3] EN 16174, *Sludge, treated biowaste and soil — Digestion of aqua regia soluble fractions of elements*

[4] EN 16321-1:2013, *Petrol vapour recovery during refuelling of motor vehicles at service stations — Part 1: Test methods for the type approval efficiency assessment of petrol vapour recovery systems*

[5] CEN/TR 16797 (all parts), *Construction products: Assessment of release of dangerous substances — Guidance on the statistical assessment of declared values*

[6] EN ISO 9000:2005, *Quality management systems — Fundamentals and vocabulary (ISO 9000:2005)*

[7] EN ISO 14001:2015, *Environmental management systems — Requirements with guidance for use (ISO 14001:2015)*

[8] EN ISO 14040, *Environmental management — Life cycle assessment — Principles and framework (ISO 14040)*

[9] EN ISO 14050:2010, *Environmental management — Vocabulary (ISO 14050:2009)*

[10] ISO 17403, *Rubber — Determination of magnesium content of field and concentrated natural rubber latices by titration (cyanide-free method)*

[11] ISO 78-2, *Chemistry — Layouts for standards — Part 2: Methods of chemical analysis*

[12] ISO 3534-1:2006, *Statistics — Vocabulary and symbols —- Part 1: General statistical terms and terms used in probability*

[13] ISO/IEC Guide 2:2004, *Standardization and related activities — General vocabulary*

[14] *REGULATION (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC*

[15] Council Directive 76/211/EEC relating to the making-up by weight or by volume of certain prepackaged products