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## Solid biofuels — Simplified sampling method for small scale applications

*Biocombustibles solides — Méthode d'échantillonnage simplifiée pour  
les applications à petite échelle*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take Part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 238, *Solid biofuels*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

The objective of this document is to provide unambiguous and clear principles for sampling of solid biofuels from small scale applications and storages. It is to serve as a tool to enable efficient trading of biofuels and to enable good understanding between seller and buyer. It is also a tool for communication with equipment manufacturers. It will also facilitate the development of sampling plans and reporting.

This document is intended for all stakeholders.

Priority in this document is to take a number of increments which is possible to handle at small applications under practical aspects. In ISO 18135 the priority is to obtain a sample with a defined precision and to calculate the minimum number of increments on basis of the corresponding precision data.

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# Solid biofuels — Simplified sampling method for small scale applications

## 1 Scope

This document describes simplified methods for taking samples of solid biofuels in small scale applications and storages including preparation of sampling plans and reports. The main focus is on storages with a size of  $\leq 100$  t. This document is applicable to the following solid biofuels:

- 1) fine (up to about 10 mm nominal top size) and regularly-shaped particulate materials that can be sampled using a scoop or pipe, e.g. sawdust, olive stones and wood pellets;
- 2) coarse or irregularly-shaped particulate materials (up to 200 mm nominal top size) that can be sampled using a fork or shovel, e.g. wood chips, hog fuel and nut shells;
- 3) large pieces (above 200 mm nominal top size) which are picked manually (e.g. firewood and briquettes).

This document can also be used for other solid biofuels not listed above if the procedures described in this document are applicable. This document specifies methods to be used, for example, when a sample is to be tested for moisture content, ash content, calorific value, bulk density, mechanical durability, particle size distribution, ash melting behaviour and chemical composition.

Additionally, it describes a method for the reduction of sample size and defines requirements on handling and storage of samples.

NOTE 1 If higher precision of analytical results is needed or when in doubt if this document is applicable ISO 18135 can be used. Using the number of increments given in this document the resulting precision for analytical results can be estimated with the formulas given in ISO 18135.

NOTE 2 Pellets can generate CO and CO<sub>2</sub> off gasses by nature. If pellets are sampled, check for CO and CO<sub>2</sub> and O<sub>2</sub> levels prior and during the sample taking process in a confined space like a container, silo or shed and have another person standby at the entrance.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14780, *Solid biofuels — Sample preparation*

ISO 16559, *Solid biofuels — Terminology, definitions and descriptions*

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

**3.1  
combined sample**

*sample* consisting of all the increments taken from a *lot* or *sub-lot*

Note 1 to entry: The *increments* may be reduced by division before being added to the combined *sample*.

[SOURCE: ISO 16559:2014, 4.52]

**3.2  
increment**

portion of fuel extracted in a single operation of the *sampling* device

[SOURCE: ISO 16559:2014, 4.122]

**3.3  
laboratory sample**

combined *sample* or a sub-sample of a combined sample for use in a laboratory

[SOURCE: ISO 16559:2014, 4.124]

**3.4  
lot**

defined quantity of fuel for which the quality is to be determined

[SOURCE: ISO 16559:2014, 4.128, modified — Note 1 to entry has been removed.]

**3.5  
nominal top size**

aperture size of the smallest sieve through which at least 95 % by mass of the material passes during the determination of particle size distribution

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Note 1 to entry: For selection of sieves types and aperture sizes see ISO 17827-1 and ISO 17827-2.

Note 2 to entry: For pellets the diameter is used.

[SOURCE: ISO 16559:2014, 4.137, modified — Note 1 and 2 to entry have been added for additional information, the word "smallest" has been added and the words "of solid fuels" have been deleted.]

**3.6  
sample**

quantity of material, representative of a larger quantity for which the quality is to be determined

[SOURCE: ISO 16559:2014, 4.170, modified — "(all increments)" has been removed from the definition, Note 1 to entry has been removed.]

**3.7  
sub-lot**

part of a *lot* for which a test result is required

EXAMPLE Material in a transport unit or on a particular stockpile.

[SOURCE: ISO 16559:2014, 4.197, modified — Example has been added.]

**3.8  
sub-sample**

portion of a *sample*

[SOURCE: ISO 16559:2014, 4.198]



## 4 Symbols and abbreviated terms

$d_{95}$	is the nominal top size of the biofuel [mm];
$m$	is the mass of the lot or subplot [kg or t];
$V_{\text{incr}}$	is the minimum volume of an increment [l];
$V_{\text{req}}$	is the volume required for the foreseen analyses [l];
$W$	is the width of a sampling tool [mm].

## 5 Principle

The main principle of sampling is to obtain (a) representative sample(s) from the whole lot concerned. Every particle in the lot or sub-lot to be represented by the sample should have an equal probability of being included in the sample. In order to do so a sampling plan is needed. [Figure 1](#) shows the main steps of a sampling procedure.

Under certain circumstances (e.g. certain construction types of built in storages, silos or containers) representative sampling might not be possible.

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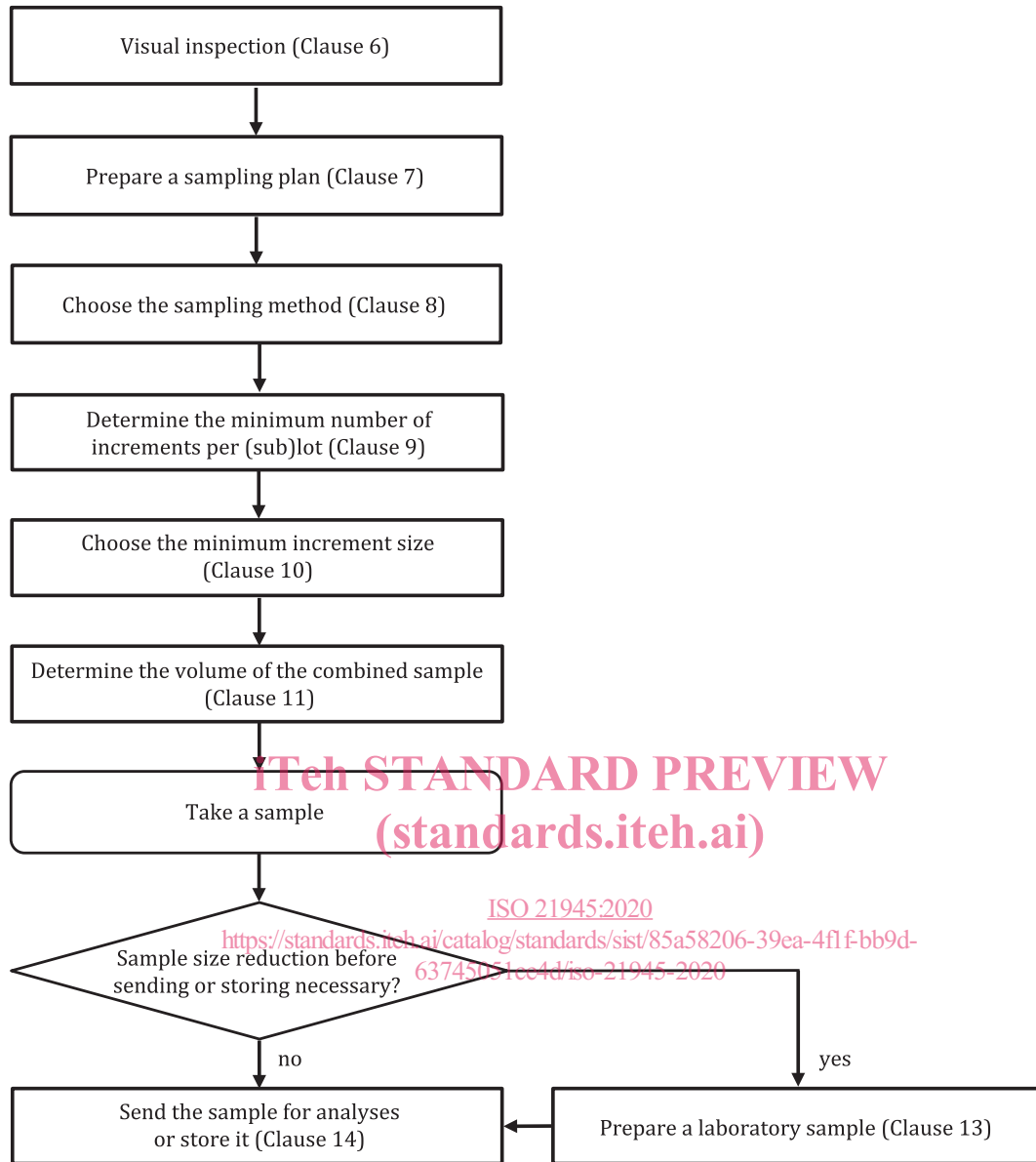


Figure 1 — Procedure for sampling

## 6 Visual inspection

Visual inspection shall be used for the choice or verification of the classification of the solid biofuels. Based on the sampling plan, verification or selection of the sampling equipment and the sampling method shall also be made by visual inspection. If the lot/sub-lot consists of substantially inhomogeneous material or if it contains impurities (such as soil or pieces of metal) this shall be stated in the sampling report. If the biofuel type or the quality of it is diverging strongly from the one expected, the sampler shall report without any delay to the appropriate party for further instructions.

If the particle size distribution should be analysed the visible surface of the complete lot should be inspected for the longest particle — in addition to the sampling and testing — and its length shall be noted in the sampling report.

NOTE 1 It is advisable to take photographs of deviations noted during visual inspection.

NOTE 2 For documentation of oversized particles photographs are useful. Therefore, it is advisable to include a folding rule or any other scale into the photograph to enable the estimation of the particles size.

## 7 Preparing sampling plan and report

The sampler shall prepare the sampling plan. The sampling plan may be prepared either by using a copy of the form presented in [Annex A](#) or by preparing his own forms or documents containing the appropriate items selected from those shown in [Annex A](#).

Once completed, this form becomes a sampling report.

The sampling plan shall include the key elements:

- a) a reference to this document (ISO 21945:2020);
- b) the unique identification code of the sample;
- c) the name and contact data of the sampler;
- d) the date and time of sampling;
- e) information required in order to identify the origin of the sample (e.g. supplier(s), location of storage, customer, trade name);
- f) the type of lot or sub-lot (e.g. pile, silo, cargo hold, storage, lorry);
- g) sampling from stationary or moving material;
- h) the identification code of the lot or the sub-lot;
- i) the mass or volume of the sub-lot or the lot;
- j) the traded form of the biofuel (wood pellet, briquette, chips, etc.);
- k) the number of increments;
- l) the required volume of sample;
- m) the volume of sample sent to the laboratory and number of packages if applicable;
- n) the question, if the combined sample has been divided before sending to the laboratory;
- o) the type of packaging of the sample sent to the laboratory (e.g. airtight container, plastic bag).

Also consider including the following items:

- p) in case of sampling stationary material: location (centre, bottom, etc.) from where the sample was obtained (optional: mark sampling locations in a sketch);
- q) storage information of the lot (e.g. how to reach the material, weather conditions, storage inside or outside, covered or uncovered);
- r) the sampling technique, e.g. shovelling, sampling pipe, stopped belt, etc.;
- s) existence of material of other origin in the same storage or pile (incl. estimated amount if possible), e.g. residues of a former lot of pellets in a pellet storage;
- t) the approximate nominal top size (visual assessment);
- u) any other details (e.g. visual inspection remarks).