

BS EN 15442:2011



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Solid recovered fuels — Methods for sampling

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee PTI/17, Solid biofuels.

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

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Solid recovered fuels - Methods for sampling

Combustibles solides de récupération - Méthodes
d'échantillonnage

Feste Sekundärbrennstoffe - Verfahren zur Probenahme

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Foreword

This document (EN 15442:2011) has been prepared by Technical Committee CEN/TC 343 “Solid recovered fuels”, the secretariat of which is held by SFS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2011, and conflicting national standards shall be withdrawn at the latest by September 2011.

This document supersedes CEN/TS 15442:2006.

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 document is one of a series of European Standards dealing with solid recovered fuel.

EN 15442, *Solid recovered fuels — Methods for sampling*.

EN 15443, *Solid recovered fuels — Methods for the preparation of the laboratory sample*.

EN 15413¹⁾, *Solid recovered fuels — Methods for the preparation of the test sample from the laboratory sample*.

This document differs from CEN/TS 15442:2006 mainly as follows:

- a) results of interlaboratory tests supplemented as an informative Annex F;
- b) whole document editorially revised.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

¹⁾ To be published.

Introduction

The testing of solid recovered fuel enables informed decisions about their subsequent handling and use. In order to carry out a test on a solid recovered fuel a sample of the material is required. Before any sampling operation is devised it is important that the objectives for sampling are clearly identified and subsequently well executed to ensure that the expectations of any involved parties are recognized and satisfied. The identification of objectives helps to define the level of testing required, e.g. thorough examination or routine testing and in addition desired reliability of testing / assessment and frequency of testing. The sampling objectives, along with the sequence of operations required to fulfill them are detailed in an overall sampling plan. After a sampling plan has been prepared the sampling of solid recovered fuels (SRF's) itself can be implemented.

Figure 1 shows the links between the essential elements of a testing program.

Sampling procedures are provided for a range of process streams and common storage conditions. The sampling technique adopted depends on a combination of different characteristics of the material and circumstances encountered at the sampling location. The determining factors are:

- the type of solid recovered fuel;
- the situation at the sampling location / the way in which the material occurs (e.g. in a stockpile, on a conveyor belt, in a lorry);
- the (expected) degree of heterogeneity (e.g. monostreams, mixed fuels, blended fuels).

This European Standard is primarily geared toward laboratories, producers, suppliers and purchasers of solid recovered fuels, but is also useful for the authorities and inspection organizations.

Standards for sampling of solid biofuels are available from Technical Committee CEN/TC 335 "Solid biofuels" CEN/TR 14589:2003, CEN/TR 15018:2005 and CEN/TR 15310:2006 for the sampling for the purpose of the characterization of waste are available from CEN/TC 292.

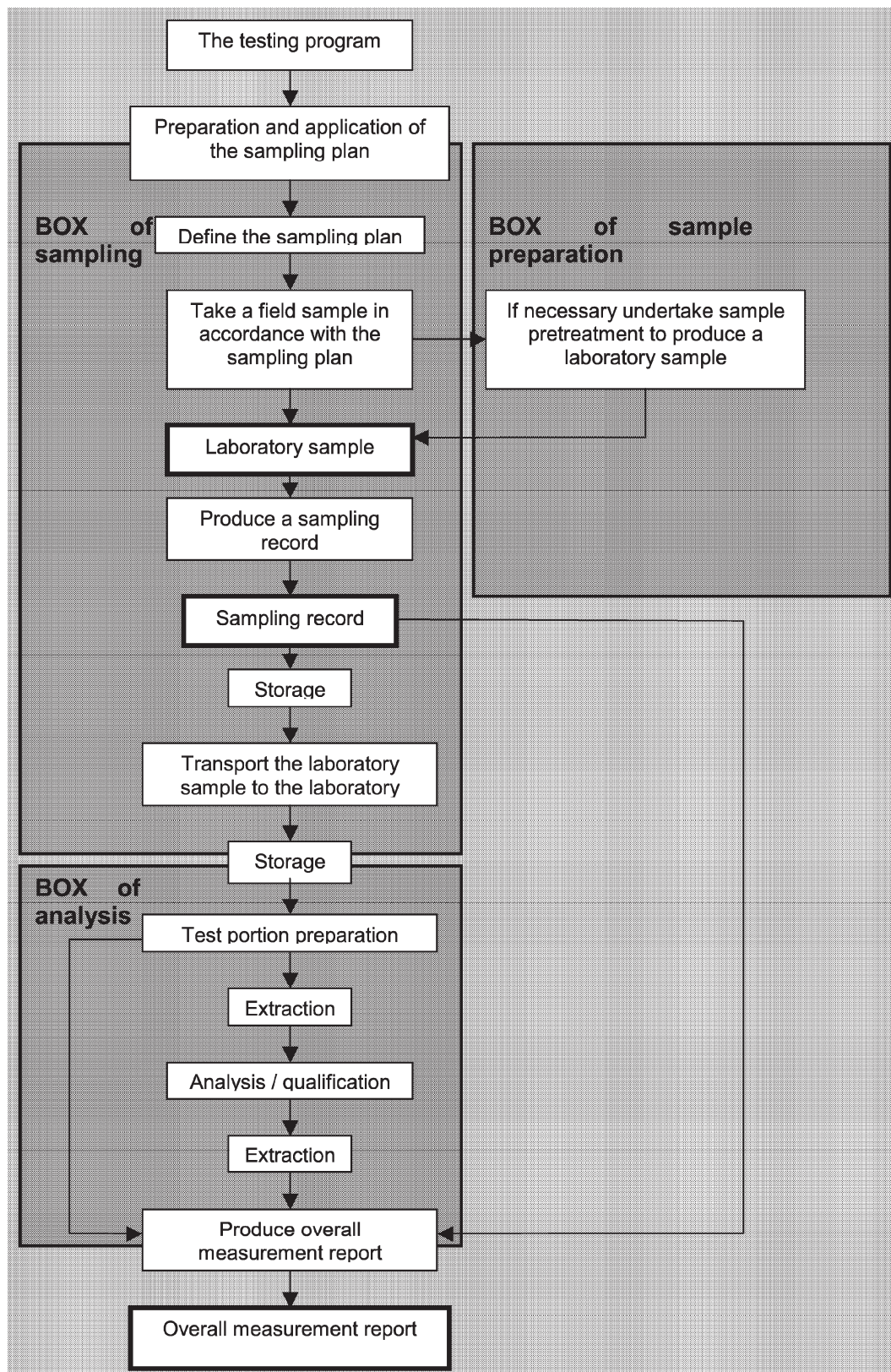


Figure 1 — Links between the essential elements of a testing program

1 Scope

This European Standard specifies methods for taking samples of solid recovered fuels for example from production plants, from deliveries or from stock. It includes manual and mechanical methods.

It is not applicable to solid recovered fuels that are formed by liquid or sludge, but it includes dewatered sludge.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 15357:2011, *Solid recovered fuels — Terminology, definitions and descriptions*

CEN/TS 15401:2010, *Solid recovered fuels — Determination of bulk density*

EN 15413²⁾, *Solid recovered fuels — Methods for the preparation of the test sample from the laboratory sample*

EN 15415-1²⁾, *Solid recovered fuels — Determination of particle size distribution — Part 1: Screen method for small dimension particles*

EN 15443, *Solid recovered fuels — Methods for the preparation of the laboratory sample*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15357:2011 and the following apply.

3.1

coefficient of variation

estimate of the standard deviation of a population from a sample of n results divided by the mean of that sample. Frequently stated as a percentage

NOTE Adapted from Eurachem/Citac Guide CG 4 [26].

3.2

duplicate sample

two samples taken under comparable conditions, whereby this selection can be accomplished by taking units adjacent in time or space

NOTE 1 Although the replicate samples are expected to be identical, often the only thing replicated is the act of taking the physical sample.

NOTE 2 A duplicate sample is a replicate sample consisting of two portions.

NOTE 3 The replicate sample is usually used to estimate sample variability.

3.3

effective increment size

minimum sample size divided by the number of increments

²⁾ To be published.

NOTE The effective increment size should never be smaller than the minimum increment size.

3.4
effective sample size

effective increment size multiplied by the number of increments

NOTE The effective sample size should never be smaller than the minimum sample size.

3.5
granular

more or less spherical or cubic

3.6
heterogeneity

degree to which a property or type of particle of a solid recovered fuel component is not uniformly distributed throughout a quantity of material

3.7
homogeneity

degree to which a property or a type of particle of a solid recovered fuel component is uniformly distributed throughout a quantity of material

3.8
increment

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

3.9
lot

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

3.10
minimum increment size

minimum dimension or size of the increment that is taken from a lot, from the point of view of preserving its representativeness

NOTE The product of the minimum increment size and the number of increments to be taken should never be smaller than the minimum sample size.

3.11
minimum sample size

minimum sample size or dimension of the sample required during sampling and sample preparation from the point of view of preserving its representativeness

NOTE The minimum sample size is equal to the effective increment size multiplied by the number of increments, and is linked directly to the nominal top size.

3.12
nominal top size

d_{95}
aperture size of the sieve used for determining the particle size distribution of solid fuels through which at least 95 % by mass of the material passes

3.13
precision

closeness of agreement between independent test/measurement results obtained under stipulated conditions

NOTE 1 Precision depends only on the distribution of random errors and does not relate to the true value or the specified value.

NOTE 2 The measure of precision is usually expressed in terms of imprecision and computed as a standard deviation of the test results or measurement results. Less precision is reflected by a larger standard deviation.

NOTE 3 Quantitative measures of precision depend critically on the stipulated conditions.

NOTE 4 Adapted from ISO 3534-2:2006.

3.14

random sampling

taking a sample at a random location within a specified range or from a specified lot. A random location is determined by lot

3.15

repeatability

precision under repeatability conditions

NOTE 1 Adapted from ISO 3534-2:2006.

NOTE 2 Repeatability can be expressed quantitatively in terms of the dispersion characteristics of the results.

3.16

reproducibility

precision under reproducibility conditions

NOTE 1 Adapted from ISO 3534-2:2006.

NOTE 2 Reproducibility can be expressed quantitatively in terms of the dispersion characteristics of the results.

NOTE 3 Results are usually understood to be corrected results.

3.17

sample

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

3.18

sample preparation

actions taken to obtain representative analysis samples or test portions from the original sample

3.19

sampling

process of drawing or constituting a sample

NOTE Adapted from ISO 3534-1:2006 [22].

3.20

sampling plan

predetermined procedure for the selection, withdrawal, preservation, transportation and preparation of the portions to be removed from a lot as a sample

NOTE Adapted from ISO 11074:2005 [23].

3.21

sampling record

report which serves as a check list and provides the investigator with all necessary information about the sampling techniques applied at the site and any additional important information

NOTE Adapted from ISO 11074:2005.

3.22

shape factor

factor that corrects the minimum sample size if the particles in a lot have not a regular shape (e.g. spherical or cubic)

3.23

static lot

lot that is not in motion during the sampling, or transported by a conveyor or alternative transport system

3.24

stratified sampling

sampling consisting of portions obtained from identified subparts (strata) of the parent population

3.25

stratified random sampling

sampling consisting of portions obtained from identified subparts (strata) of the parent population

NOTE Within each stratum, the samples are taken randomly.

3.26

test portion

sub-sample either of a laboratory sample or a test sample required for the specific measurement

3.27

trueness

closeness of agreement between the expectation of a test result or a measurement result and a true value

NOTE 1 Adapted from ISO 3534-2:2006.

NOTE 2 The measure of trueness is usually expressed in terms of bias.

NOTE 3 Trueness is sometimes referred to as “accuracy of the mean”. This usage is not recommended.

NOTE 4 In practice, the accepted reference value is substituted for the true value.

NOTE 5 The determination of the exact trueness for waste and from waste derived materials such as solid recovered fuels is by definition not possible.

4 Symbols and abbreviated terms

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

b	is the breadth of the flow, in m
cv	is the coefficient of variation
d_{05}	is the nominal minimum size (a mass fraction of 5 % of the particles are smaller than d_{05}), in mm
d_{95}	is the nominal top size of a particle (a mass fraction of 95 % of the particles are smaller than d_{95}), in mm
g	is the correction factor for distribution in the particle size
G	is the conveyor load, in kg/m
λ_b	is the bulk density of the solid recovered fuel, in kg/m ³
λ_p	is the particle density, in kg/m ³

m	is mass, in kg
n	is the number of increments to be taken per lot
p	is the fraction of the particles with a specific characteristic (such as a specific contaminant), in kg/kg, and is equal to 0,1
Φ_f	is the bulk density of the flow, in kg/m ³
Φ_d	is the drop flow, in kg/s
f	is the shape factor, in m ³ /m ³
V	is volume, in m ³
v	is conveyor velocity, in m/s

5 Principle

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. When this principle cannot be applied in practice, the sampler shall note the limitations in the sampling plan.

6 Development of a sampling plan

6.1 Principle

From a pre-defined lot of solid recovered fuel, samples shall be taken representatively on the basis of a sampling plan that shall be drawn up before the sampling takes place. Annex A specifies how this sampling plan shall be made. Annex J specifies simplified sampling plans for three common situations according to this clause and Annex A. Figure 2 determines whether a simplified sampling plan can be used.

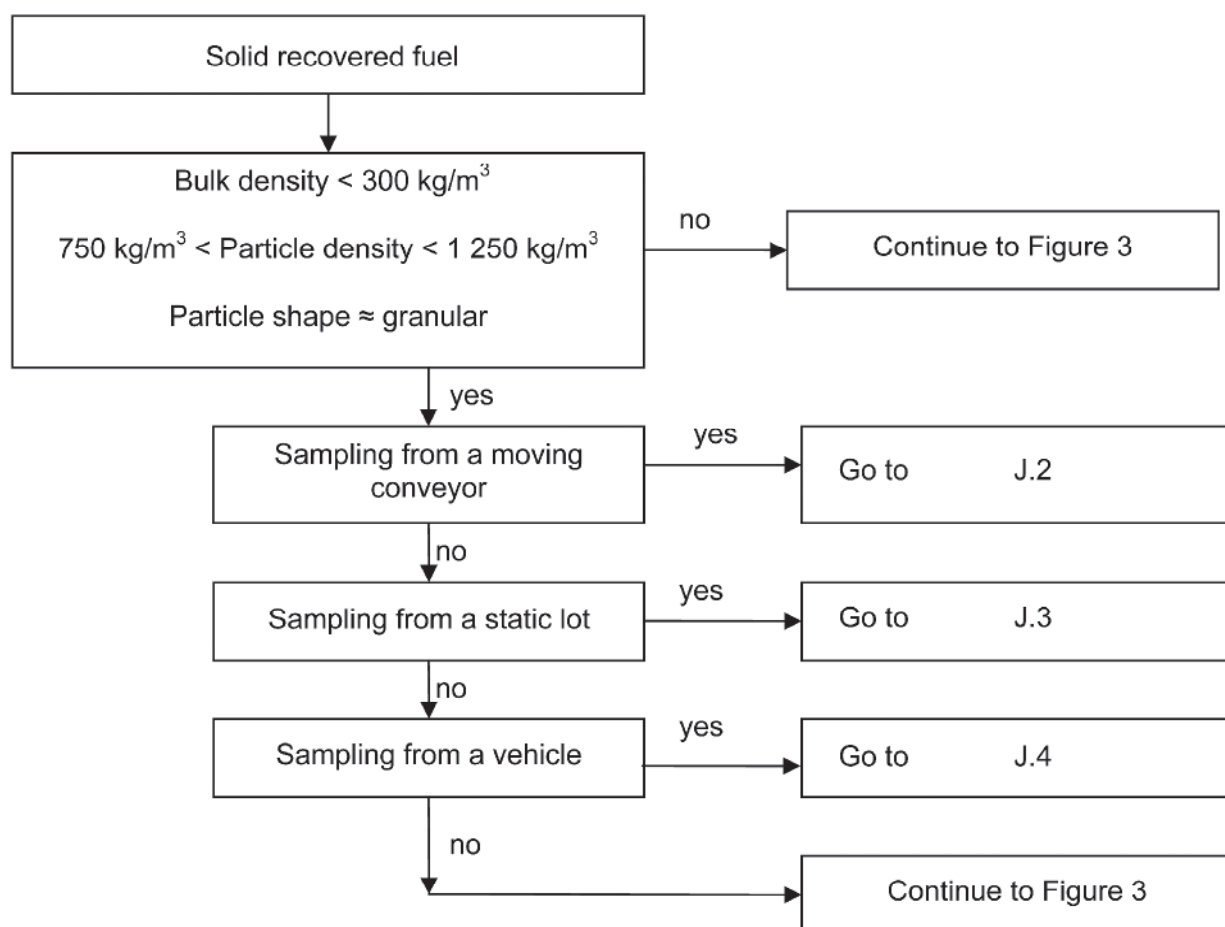


Figure 2 — Check for the standard sampling plan

The sampling plan shall be drawn up on the basis of the objective for the sampling process, using the available data on a solid recovered fuel and the accessibility of the lot, see Annex B. The sampling plan shall be completed. If certain estimates concerning specific parameters relating to the lot cannot be determined with sufficient certainty on the basis of the information available, these shall be verified in the field. If necessary, the sampling plan shall be adjusted in the field and the deviations shall be reported in the sampling record. Figure 3 shows the actions that are necessary for the development of a sampling plan.

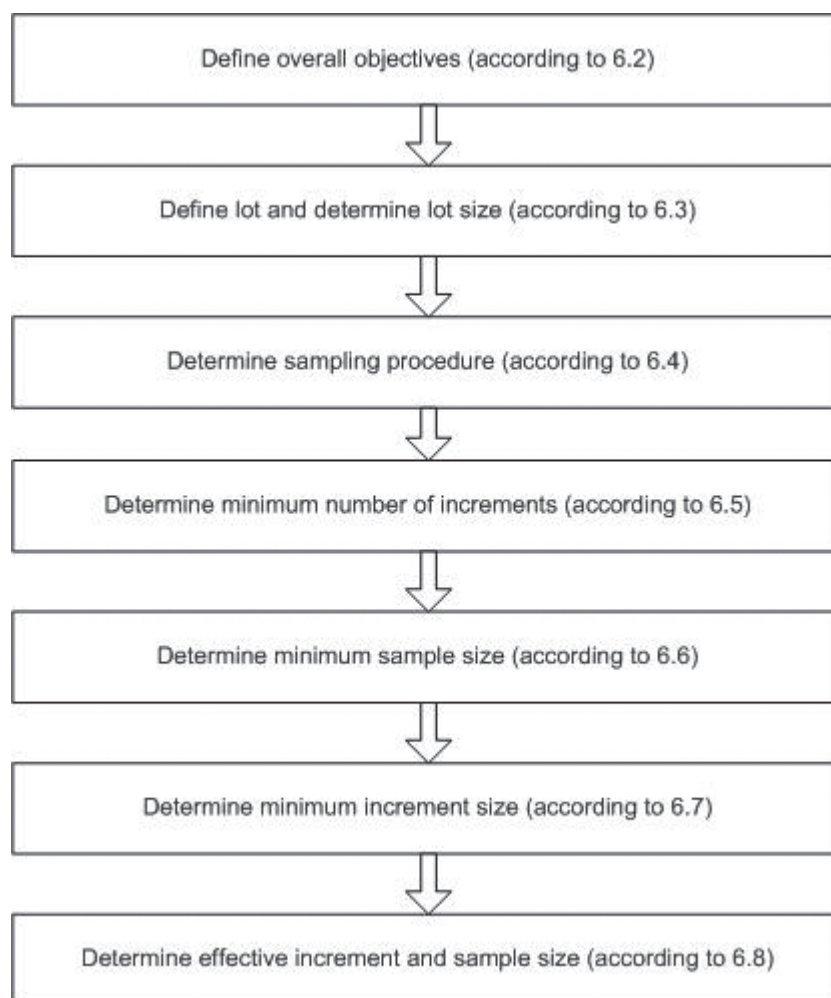


Figure 3 — Necessary elements for the development of a sampling plan

6.2 Definition of overall objectives

The sampling plan shall specify the objectives of the sampling program through consultation with all involved parties. These involved parties are e.g. the client, the producer of the solid recovered fuel, the sampler. The sampling plan shall specify the primary objectives of the sampling program. The sampling plan shall meet the requirements of objectives. If it is not possible to meet all requirements following the objectives for sampling in one single document sampling plan, two or more sampling plans shall be made in order to achieve adequate sampling plans for all objectives.

The sampling plan(s) shall identify any special precautions to be followed where the solid recovered fuel to be sampled is hazardous to human health.

6.3 Definition of a lot and determining lot size

6.3.1 General

The lot shall be defined on the basis of the way in which the material is or has been produced and/or is offered (upon delivery, upon acceptance, upon storage or in store, for instance). The lot size relates to a quantity of material delivered on the basis of one specification and production process. This material is agreed on by contract as a unit, and is identifiable as such. The maximum weight of a lot or sub-lot, for sampling purposes, shall be no more than $1,5 \times 10^6$ kg.

If the contracted lot weighs more than $1,5 \times 10^6$ kg it shall be split into two or more separate lots in order to maintain the lot size below or at the maximum lot size. The lot definitions in 6.3.2 to 6.3.5 are possible:

6.3.2 Definition of a lot in case sampling from a material flow

The lot shall be either defined as a period of production or as the period in which a certain amount of solid recovered fuel is transported through the material flow.

6.3.3 Definition of a lot in case of transport by a vehicle

The total lot shall compromise the contents of the entire series of 1 or more vehicles used to transport the lot. A vehicle can be both a lorry or a (railway) truck.

6.3.4 Definition of a lot in case of transport by ship

The total lot shall compromise to the contents of the entire series of 1 or more ships used to transport the lot. If the ship contains more than $1,5 \times 10^6$ kg the ship shall be divided in such a number of sub-lots that the size of a sub-lot is no more than $1,5 \times 10^6$ kg.

If one ship contains several lots (in other words, quantities of material that differ from each other with regard to the specifications agreed on in a contract with the producer of the material beforehand), these lots shall be stored in separate compartments in the ship. In that case, a lot relates to the quantity of material that is transported and delivered by separate compartments.

6.3.5 Definition of a lot in case of sampling from a static lot

If the material has been stored at the producer's or purchaser's premises in a (temporary) store, the (static) lot relates to the quantity of material with the specifications agreed on beforehand in a contract within a demarcated area.

6.4 Determination of the sampling procedure

The sampling method that shall be used shall be representative. Therefore, the material shall preferably be sampled from a moving transport medium. Various sampling methods exist. In the list below these methods are shown in the order of preference in which the methods shall be used. The representativeness decreases as you go down the list. You shall only choose a less representative method if a more representative one is not possible in the existing situation.

- a) mechanically from a drop flow. The method specified in G.4 shall be used for this situation;
- b) mechanically from a moving conveyor. The method specified in G.5 shall be used for this situation;
- c) manually from a stationary conveyor. The method specified in G.6 shall be used for this situation;
- d) manually from a drop flow. The method specified in G.4 shall be used for this situation;
- e) manually from a vehicle. The method specified in Annex H shall be used for this situation;
- f) from a (temporary) store. The method specified in Annex H shall be used for this situation.

6.5 Determination of the number of increments

The minimum number of increments shall be 24. This means that for a lot size of 120 tons on the average every 5 tons an increment has to be taken. For a lot size of 1 320 tons this means that on the average every 51 tons an increments needs to be taken.

It is possible to take more increments. Reasons for taking more increments can be:

- if more sample material is required;
- if it is easier to stratify the lot in different number of strata e.g. 5 by 5 = 25 strata.

6.6 Determination of minimum sample size

In Annex D it is specified how the minimum sample size shall be determined.

6.7 Determination of the minimum increment size

6.7.1 Determination of minimum increment size for material flows

If samples are taken from a material flow or from a conveyor, the minimum increment size shall be determined using the instructions in Annex E, in which a distinction is made between the following situations for the purposes of determining the minimum increment size:

- mechanical and manual sampling from a drop flow;
- sampling from a conveyor. Here, for the purposes of determining the minimum increment size, no distinction is made between mechanical sampling from a moving conveyor and manual sampling from a stationary conveyor.

6.7.2 Determination of the minimum increment size for static lots or vehicle

If samples are taken from static lots or vehicles (lorry, truck or ship), the minimum increment size shall be determined using the instructions in Annex F.

6.8 Determination of the effective increment and sample sizes

6.8.1 Determination of the effective increment size

The effective increment size shall meet the three requirements below:

- the effective increment size shall be at least as large as the minimum increment size;
- the effective increment size shall be large enough in order to obtain a sample of the minimum sample size with the selected number of increments;
- the effective increment size shall be large enough in order to obtain a sample sufficiently large enough for the analysis in the laboratory.

6.8.2 Determination of the effective sample size

The effective sample size shall meet the three requirements below:

- the effective sample size shall be at least as large as the minimum sample size;
- the effective sample size shall be large enough in order to equal at least the minimum increment size multiplied by the number of increments;
- the effective sample size shall be large enough for the analysis in the laboratory.

Only if the nominal top size is more than 40 mm the effective sample size may be reduced in order to downscale the sample size to realistic proportions. The reduction of the particle size and the sample size shall be done according to EN 15443, but the sampling report and the analyses report shall clearly mention this deviation and state that therefore the testing results are less representative.

6.9 Selection of distribution of increments over a lot

6.9.1 General

The increments shall be taken scattered all over the lot. Each particle in the lot shall have an equal chance of ending up in the sample. The following sampling methods (arranged in decreasing order of preference) shall be used:

- a) stratified random sampling;
- b) stratified sampling.

“Stratified” means that a quantity of material (expressed as a mass or volume) or a time interval is divided into a specific number of equal strata (sections). Examples of sampling for clarification are shown in Annex L.

6.9.2 Determination of the distribution of the increments when sampling from a material flow

If the sampling is planned from a material flow, the time when each increment is to be sampled shall be determined. This requires the following approach:

- a) the lot shall be either defined as a period of production or as the period in which a certain amount of solid recovered fuel is transported through the material flow;
- b) this period shall be divided by the number increments in order to obtain equal strata (sub periods) for each increment;
- c) the exact time within each stratum shall be determined either random or fixed in the middle of the period.

6.9.3 Determination of the distribution of the increments when sampling from a vehicle(s)

If the sampling is planned from a vehicle, the locations in the vehicle(s) shall be determined. This requires the following approach:

- a) the lot shall be defined as a number of vehicles with a minimum of one vehicle;
- b) from each vehicle the same number of increments shall be taken;
- c) the number of increments per vehicle multiplied by number of vehicle shall at least the minimum number of increments;
- d) if it is possible and sufficiently safe for the sampler to do so, this increment may be taken directly from the vehicle. If this is not possible, the increment may be taken directly after the material has been unloaded in accordance with the system for sampling from a material flow (6.9.2) or from a static lot (6.9.4);
- e) for each vehicle selected, take the increments from the top, middle and bottom of the material alternately, i.e. increment 1 from the top of the material in the first vehicle selected, increment 2 from the middle of the material in the second vehicle selected, increment 3 from the bottom of the material in the third vehicle selected, and so on.

The sampling shall be implemented by performing the complete sampling plan.

EXAMPLE 1 A lot of 3×10^6 kg solid recovered fuels consisting of pellets, will be transported to a purchaser by a total of 120 lorries, with an average load of 25 000 kg per lorry. The maximum lot size is $1,5 \times 10^6$ kg. The quantity above the maximum permitted lot size should be regarded, for sampling purposes, as a new lot or sub-lot. The total lot of 3×10^6 kg is therefore split into two separate sub-lots for sampling of $1,5 \times 10^6$ kg each. For each sub-lot of $1,5 \times 10^6$ kg, the minimum number of increments that are taken is 24. Sampling requires the following approach:

Step 1) The weight of the total lot is 3×10^6 kg. For sampling purposes, this is regarded as two sub-lots weighing $1,5 \times 10^6$ kg each. The first sub-lot will be transported by a series of 60 lorries;

Step 2) At least 24 increments should be taken for each sub-lot of $1,5 \times 10^6$ kg, but because 30 increments is easier regarding the number of 60 lorries it is decided that 30 increments will be taken. Therefore from the first sub-series and then from every consecutive sub-series of $60/30 = 2$ lorries, a lorry is selected for sampling in a (preferably) random way each time. For example, from the first sub-series (lorry 1 – lorry 2), lorry number 1 is sampled, from the second sub-series (lorry 3 – lorry 4) lorry number 4 is sampled, from the third sub-series (lorry 5 – lorry 6) lorry number 5 is sampled, and so on;

Step 3) The increment should be taken randomly from the top of the material in lorry number 1, from the middle of the material in lorry number 4, from the bottom of the material in lorry number 5, and so on. The dimensions of each increment shall be at least equal to the already determined minimum or effective increment size.

Steps 1 to 3 shall be completed again for the sampling process involving the second sub-lot of $1,5 \times 10^6$ kg.

NOTE 1 If for example 2 increments should be taken from each of the lorry, it would be very useful to take one increment at the beginning of unloading of the lorry (short stop during loading) and the second increment at the middle/end of unloading the lorry in accordance with the system for sampling from a material flow (6.9.2) or static lot (6.9.4).

NOTE 2 If the dimensions of a lot are such that the number of vehicles used to transport the lot is equal to or less than the (minimum) number of required increments, at least two (or more when necessary) increments should be taken per vehicle.

6.9.4 Implementation of sampling from a static lot

Implementation of sampling from a static lot or store requires the following approach:

- a) determine the dimensions of the lot or store;
- b) divide the lot or store into as many strata of equal dimensions as the number of increments to be taken;
- c) for each stratum, determine in a (preferably) random way the location where the increments will be taken;
- d) for each location, take the increments from the top, middle and bottom of the material alternately.

The sampling shall be implemented by performing the complete sampling plan.

EXAMPLE 2 A lot of solid recovered fuel of 1×10^6 kg, which shall be sampled, has a volume of 3 000 m³. The lot is 60 m long, 40 m wide and 1,25 m high. Twenty-four increments are taken from the lot. The following approach is used for the sampling process:

- 1) the surface area of the lot is 2 400 m², and the number of increments to be taken is 24. The lot can therefore be divided into 24 sections of 10 m by 10 m (100 m²);
- 2) for each stratum of 100 m², the increment location is determined (the x and y values) in a random way and one increment is taken;
- 3) for each location drawn, take the increments from the top, middle and bottom of the material alternately, i.e. increment 1 from the top of the material within stratum 1, increment 2 from the middle of the material within stratum 2, increment 3 from the bottom of the material within stratum 3, and so on.

7 Implementation of the sampling plan

7.1 Steps before actual sampling

The following things shall be performed by the sampler before the actual sampling:

- a) control of all relevant data in the sampling plan;
- b) control of the nominal top size. If the nominal top size is larger than stated in the sampling plan, the project leader shall be notified and a new effective sample and increment size shall be determined and mentioned at deviations;
- c) control of the lot size. If the lot size is deviating from the sampling plan it shall be adjusted;
- d) control whether the lot appears to be one lot and does not originate from two or more different lots. Make sure the lot does not originate from two or more different lots. If the lot originates from more than one lot, each lot shall be sampled separately;
- e) make a situation sketch or pictures from different angles;
- f) if steps a) to e) require adjustments of the sampling plan these shall be reported in the sampling report and sufficiently justified.

7.2 Steps during sampling

The following things shall be performed during sampling:

- a) if sample is taken manually it is important that the increment is taken in one movement and that no material is removed from the increment after it is taken. In case the size of an increment is too large a new increment shall be taken;
- b) the sampler shall not judge the quality of an increment nor discard it and shall not take a new one if he thinks the increment is not representative. This will influence the representativeness of the sample. In every case the upper surface of the material to be sampled shall always be removed to avoid material that has dried and/or become contaminated;
- c) if during the performance of the sampling anything is performed deviating from the sampling plan this shall be mentioned in the sampling report in the section for deviations. The deviations shall be sufficiently motivated.

7.3 Steps after sampling

The following things shall be done after sampling:

- a) the sampling plan shall be finished by the sampler;
- b) the sampling containers shall be closed and sufficiently labelled.

8 Handling and storage of samples

The sampling plan shall identify the procedure(s) selected for packaging, preservation, storage, and transport of the laboratory sample. The samples shall be kept in a dry cooled space, in tightly sealed packaging. If the dimensions of the (sub-)samples are larger than 1 m³, they should be kept in a cold and dry room preferably covered. The effective dimensions are determined by the maximum permitted quantity prescribed for the determination concerned and the minimum required quantity of sample material. Samples that are stored shall be pre-dried according to EN 15443.

Samples containing more than 15 % moisture by weight shall be stored for a maximum of one week at maximum 5 °C. If longer time for storing is required samples have to be pre-dried to avoid problems with moisture (drying effect and micro-organisms decomposing the sample).

9 Precision

The tests results for a measurement on solid recovered fuels are usually applied for the enforcement of regulation or for contract execution. In such legal situations it is vital that the associated uncertainties for the tests results are known.

Data regarding the uncertainty of this European Standard has been acquired through the validation investigation QUOVADIS. The results of QUOVADIS give information on the uncertainty of the sampling method.

Two reasons cause that these results of QUOVADIS cannot be available as normative data on the precision of the sampling:

- 1) the trueness of a measurement regarding solid recovered fuel is by definition not available, because knowledge on the true composition of solid recovered fuel is by definition unknown;
- 2) validation data shall be available for each specific matrix and therefore each type of solid recovered fuel.

Therefore, data on the precision of the method for sampling of solid recovered fuels is only shown in Annex K.

Annex A (normative)

Procedure for the development of a sampling plan

A.1 Introduction

This annex specifies a procedure for the development of a sampling plan.

A.2 Principle

In A.3 a procedure for the development of sampling plan specifies in 9 parts with 27 steps how a sampling plan shall be made.

A.3 Procedure

Part 1 Defining lot and lot size

- 1) What form does the solid recovered fuel take (fluff, pellets, bales, powder...)? Make a note.
- 2) Which company has the lot of solid recovered fuel come from? Make a note.
- 3) What are the estimated dimensions of the lot or sub-lot? Make a note.

Part 2 Gathering information on the sampling location and possible sampling procedure

- 4) During the installation, is there any facility for taking samples mechanically from the drop flow, or can such a facility be realized? If so, make a note and go to step 9.
- 5) During the installation, is there any facility for taking samples mechanically from the conveyor belt, or can such a facility be realized? If so, make a note and go to step 9.
- 6) During the installation, is there any facility for taking samples manually from a stationary conveyor belt, from the drop flow, or can such a facility be realized? If so, make a note and go to step 9.
- 7) During the installation, is there any facility for taking samples manually from the drop flow? If so, make a note and go to step 9.
- 8) Is there any facility for taking samples manually from a vehicle? If so, make a note and go to step 9. If not, take a sample of the solid recovered fuel from a static lot, and go to step 9.

Part 3 Gathering information on the solid recovered fuel

- 9) What components does the solid recovered fuel consist of (plastics, paper, wood, organic material, sand...), and what is the nominal top size of these components? The producer's data can be used for this. Make a note.
- 10) What is the dominant shape of the particles with the nominal top size (flat pieces or more or less granular)? Make a note.
- 11) What is the bulk density of the solid recovered fuel? Make a note.

- 12) What is the average particle density of the components of the solid recovered fuel? Make a note.

Part 4 Determination of increment and sample size

- 13) Using the data from part 1, 2 and 3, determine the minimum and effective increment sizes in kg and l. Make a note. Clearly write down when any deviations occur.
- 14) Using the data from part 1, 2 and 3, determine the minimum and effective sample sizes, and ascertain using the data from Annex I, whether or not this sample size is sufficient for the required analyses, any reserve samples, duplicate samples or countercheck samples. Make a note. Clearly write down when any deviations occur.

Part 5 Determination of the number of increments to be taken and the times or locations of the increments

- 15) For sampling from a material flow, go to part 6. For sampling from a vehicle, go to part 7. For sampling from a static lot, go to part 8.

Part 6 Sampling from a material flow

- 16) Determine how much time is needed to transport a lot, or the defined duration of the lot size.
- 17) Divide this time into equal time intervals, so that one time interval is available for each increment.
- 18) Determine the sampling time for each time intervals, preferably in a random way.
- 19) Go to part 9 for the instruction how to store the sample.

Part 7 Sampling from a vehicle

- 20) Determine, preferably in a stratified random way, which units of vehicles from the entire series of vehicles (which contain the entire lot) qualify for sampling. Determination in a stratified random way is explained in L.3.
- 21) Take at least one increment from each vehicle selected for the sampling process. If it is possible and sufficiently safe for the sampler, this increment may be taken directly from the vehicle. If this is not possible, the increment may be taken directly after the material has been unloaded, in accordance with the system for sampling from a material flow (part 6), or from a static lot (part 8).
- 22) For each vehicle selected, take the increments from the top, middle and bottom of the material alternately, i.e. increment 1 from the top of the material in the first vehicle selected, increment 2 from the middle of the material in the second vehicle selected, increment 3 from the bottom of the material in the third vehicle selected, and so on.
- 23) Go to part 9 for the instruction how to store the sample.

Part 8 Sampling from a static lot

- 24) Determine the dimensions of the static lot, and then divide the lot logically into a number of sections, so that for each increment required, there is one section available.
- 25) For each stratum, randomly draw the location where the increments will be taken, and then, for each location drawn, take the increments from the top, middle and bottom of the material alternately.
- 26) Go to part 9 for the instruction how to store the sample.

Part 9 Storing sample

- 27) The samples shall be wrapped and kept in tightly sealed packaging. The samples shall not be exposed to sunlight. The sampling container shall therefore not be transparent. If the size of samples is too large, they may be kept in a dark and dry room. If samples are stored for more than three days they shall be pre-dried in order to prevent changes to the sample due to biological activity.