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Characterization of waste — Sampling of waste materials —

Part 3: Guidance on procedures for sub-sampling in the field

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National foreword

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Charakterisierung von Abfall - Probenahme - Teil 3: Verfahren zur Teilprobenahme im Gelände

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This Technical Report (CEN/TR 15310-3:2006) has been prepared by Technical Committee CEN/TC 292 “Characterization of waste”, the secretariat of which is held by NEN.

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

This Technical Report is one of a series of five, dealing with sampling techniques and procedures, which provide essential information for the application of the EN-Standard:

EN 14899 Characterisation of waste - Sampling of waste materials - Framework for the preparation and application of a Sampling Plan

The principal component of the EN Standard is the mandatory requirement to prepare a Sampling Plan. This EN 14899 standard can be used to:

— produce standardised sampling plans for use in regular or routine circumstances (i.e. the elaboration of daughter/derived standards dedicated to well defined sampling scenarios);

— incorporate specific sampling requirements into national legislation;

— design and develop a Sampling Plan on a case by case basis.

The Technical Reports display a range of potential approaches and tools to enable the project manager to tailor his sampling plan to a specific testing scenario (i.e. a ‘shop shelf’ approach to sampling plan development for waste testing). This approach allows flexibility in the selection of the sampling approach, sampling point, method of sampling and equipment used.

This Technical Report describes procedures for reducing the overall size of the sample in the field, to aid practical transportation of a sample to the laboratory. It does not deal with sub-sampling in the laboratory to provide a test portion or the pre-treatment of samples prior to analysis.

This report does not attempt to provide a definitive procedure for each and every situation that may arise from sampling a given waste type or specific analytical requirement, rather it aims to expose the factors that influence the selection of these practical field activities to ensure the most appropriate procedure is selected for any given sampling scenario. The most appropriate approach, tools, and methodology, in the absence of an existing recognised Sampling Plan, should be chosen on a scenario-specific basis. However, this does not present a barrier to technical innovation, and there is no reason why methodologies other than those detailed in this Technical Report cannot be substituted.

Introduction

Wastes are materials, which the holder discards, or intends or is required to discard, and which may be sent for final disposal, reuse or recovery. Such materials are generally heterogeneous and it will be necessary therefore to specify in the testing programme the amount of material for which the characteristics of interest need to be defined. The testing of wastes allows informed decisions to be made on how they should be treated (or not), recovered or disposed. In order to undertake valid tests, some sampling of the waste is required.

The principal component of the standard EN 14899 is the mandatory requirement to prepare a Sampling Plan, within the framework of an overall testing programme as illustrated in Figure 1 of EN 14899:2005. This standard can be used to:

— produce standardised sampling plans for use in regular or routine circumstances (i.e. the elaboration of daughter/derived standards dedicated to well defined sampling scenarios);

— incorporate specific sampling requirements into national legislation;

— design and develop a Sampling Plan on a case by case basis.

The development of a Sampling Plan within this framework involves the progression through three steps or activities.

1) Define the Sampling Plan;

2) Take a field sample in accordance with the Sampling Plan;

3) Transport the laboratory sample to the laboratory.

This Technical Report provides information to support Key Step 2 of the Sampling Plan process map and elaborates on the range of potential approaches that can be used to reduce the size of a sample in the field to facilitate the appropriate storage and preservation of the sample and ultimately its transportation to the designated analytical facility.

This Technical report describes procedures for reducing the overall size of the sample in the field, to aid practical transportation of a sample to the laboratory. It does not deal with sub-sampling in the laboratory to provide a test portion, or the pre-treatment of samples prior to analysis. Samples dispatched to the laboratory may require additional sub-sampling and/or pre-treatment steps prior to analysis. Some samples may be analysed without additional treatment. Field sub-sampling should be carried out in such a way as to obtain, at all stages, a sample that is representative of the field sample. Specifically this Technical Report supports 4.2.8.2 (Procedures for sub-sampling in the field) of the Framework Standard.

This Technical Report should be read in conjunction with the Framework Standard for the preparation and application of a Sampling Plan as well as the other Technical Reports that contain essential information to support the Framework Standard. The full series comprises:

EN 14899, Characterization of waste - Sampling of waste materials - Framework for the preparation and application of a Sampling Plan.

CEN/TR 15310-1, Characterization of waste – Sampling of waste materials - Part 1: Guidance on selection and application of criteria for sampling under various conditions.

CEN/TR 15310 -2, Characterization of waste – Sampling of waste materials - Part 2 - Guidance on sampling techniques.

CEN/TR 15310 -3, Characterization of waste – Sampling of waste materials – Part 3: Guidance on procedures for sub-sampling in the field.

CEN/TR 15310 -4, Characterization of waste – Sampling of waste materials – Part 4: Guidance on procedures for sample packaging, storage, preservation, transport and delivery.

CEN/TR 15310 -5, Characterization of waste – Sampling of waste materials – Part 5: Guidance on the process of defining the Sampling Plan.

The Technical Reports contain procedural options (as detailed in Figure 2 of EN 14899:2005) that can be selected to match the sampling requirements of any testing programme.

1 Scope

This Technical Report describes procedures for reducing the overall size of the waste materials in the field to aid practical transportation of a sample to the laboratory.

NOTE 1 This Technical Report provides a shop shelf of example sampling techniques that can be selected to meet a wide range of sampling situations. For a specific situation one of the presented procedures may be appropriate.

NOTE 2 The procedures listed in this Technical Report reflect current best practice, but these are not exhaustive and other procedures may be equally relevant.

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 13965-1:2004, *Characterization of waste - Terminology - Part 1: Material related terms and definitions*

EN 13965-2:2004, *Characterization of waste - Terminology - Part 2: Management related terms and definitions*

3 Terms and definitions

For the purposes of this Technical Report the terms and definitions given in EN 13965-1:2004 and EN 13965-2:2004 and the following apply

3.1
aliquot
known amount of a homogeneous material, assumed to be taken with negligible sampling error
[ISO 11074-2]

NOTE This term is usually applied to a liquid.

3.2
composite sample
two or more increments/sub-samples mixed together in appropriate proportions, either discretely or continuously (blended composite sample), from which the average value of a desired characteristic may be obtained
[ISO 11074-2]

3.3
increment
individual portion of material collected by a single operation of a sampling device which will not be analysed / investigated as a single entity, but will be mixed with other increments in a composite sample

NOTE 1 Whenever the portion of material collected by a single operation of a sampling device is analysed individually, the obtained material is called a sample. In such a situation it is essential that the quantity of material fulfils both the criteria for the size of an increment as well as for a sample.

NOTE 2 In some languages the term 'increment' is used without the condition that an increment will never be analysed on its own. For this Technical Report this is however an essential condition in the definition of the term ‘increment’.

3.4
field sample
quantity (mass or volume) of material obtained through sampling without any sub-sampling

3.5
laboratory sample
sample(s) or sub-sample(s) sent to or received by the laboratory.
[IUPAC, definition 2.5.5]

NOTE 1 When the laboratory sample is further prepared (reduced) by subdividing, mixing, grinding, or by combinations of these operations, the result is the test sample. When no preparation of the laboratory sample is required, the laboratory sample is the test sample.

NOTE 2 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.

3.6
mixing
combining of components, particles or layers into a more homogeneous state
[ISO 11074]

3.7
particle size reduction
crushing or cutting the sample in order to reduce the particle size of the whole (sub-)sample without reducing the sample size (mass)

3.8
portion
wach of the discrete, identifiable portions of a material suitable for removal from a population as a sample or as a portion of a sample, and which can be individually considered, examined, tested or combined
[ISO 11074]

3.9
representative sample
sample in which the characteristic(s) of interest is (are) present with a reliability appropriate for the purposes of the testing programme

3.10
riffling
separation of a free-flowing sample into (usually) equal parts by means of a mechanical device composed of diverter chutes
[ISO 11074]

3.11
sample
portion of material selected from a larger quantity of material
[ISO 11074]

NOTE 1 The manner of selection of the sample should be described in a sampling plan.

NOTE 2 The use of the term ‘sample’ should be supported with a preface as far as possible as it does not indicate to which step of the total sampling procedure it is related when used alone e.g. field sample, laboratory sample.

3.12
Sampling Plan
all the information pertinent to a particular sampling activity

NOTE Predetermined procedure for the selection, withdrawal, preservation, transportation and preparation of the portions to be removed from a population as a sample. (ISO 11074:2005)

3.13
sample division
process of selecting one or more sub-samples from a sample of population
[ISO 11074]

3.14
stratum/ Strata
strata are mutually exclusive and exhaustive parts of a population. They are identified either, because they are believed to be different from each other or for the purposes of sampling

3.15
sub-sample
quantity (mass or volume) of material obtained by procedures in which the characteristics of interest are randomly distributed in parts of equal or unequal size

NOTE 1 A sub-sample may be:

a) a portion of the sample obtained by selection or division; or

b) an individual unit of the stratum taken as part of the sample; or

c) the final unit of multi-stage sampling.

NOTE 2 The term 'sub-sample' is used either in the sense of a 'sample of a sample' or as a synonym for 'unit'. In practice, the meaning is usually apparent from the context or is defined.

3.16
sub-sampling
process of selecting one or more sub-samples from a sample of a population
[ISO 11074:2005]

4 Principles of sub-sampling in the field

A method of sub-sampling should be selected that minimises possible change in the physical and chemical composition of the sample. The ultimate selection of a procedure will depend on the stated objectives of the sampling programme, detailed in the Sampling Plan, and the tests to be carried out on the sample.

Sub-sampling should be carried out in the field only if it is necessary to reduce the sample size for transportation and where the integrity of a sample and sub-samples can be assured, that is in an environment that protects the loss of moisture and volatile components due to evaporation, or cross contamination of samples. Sub-sampling activities should ideally be carried out in an appropriately equipped mobile or field laboratory to safeguard sample integrity.

Sub-sampling can be achieved with or without particle size reduction. Particle size reduction consists of crushing or grinding the sample in order to reduce the particle size of the whole or sub-sample without reducing the sample size (mass). Such reduction procedures are particularly susceptible to the loss of fine particles due to air entrainment in a field environment and such procedures should only be undertaken at the analytical facility. The procedures in this Technical Report are restricted to methods that exclude particle size reduction by grinding.

If a heterogeneous bulk sample cannot be adequately mixed in the field or field laboratory to produce a homogeneous sample it should be returned to the laboratory for sub-sampling.

When two or more laboratory samples are required from a bulk sample, the sub-sampling process should be defined in such a way that two or more sub-samples of equal size and expected equal composition are generated. In most cases, multiple equal laboratory samples are obtained from the last sub-sampling stage (if the sub-sampling process consists of more than one stage) to ensure that multiple laboratory samples are as comparable as possible

5 Apparatus

Examples of sub-sampling apparatus are given in Annex A.

Suitable apparatus may include:

— large heavy-duty plastic sheeting;

— scoop;

— spade;

— sledge hammer;

— mechanical shovel;

— sheet metal cross;

— balance;

— riffle box;

— Tyler divider;

— mechanised turntable / Rotating dividers .

NOTE In all cases, alternative designs may be used as long as the devices can be used to fulfil the sub-sampling procedures described in Clauses 7 to 12.

6 Sample preparation

6.1 Preparation for granular materials

The following procedure should be followed, where possible, prior to all sample pre-treatment activities.

— identify an area within the a covered area or of hard standing sheltered from the effects of wind and rain, preferably flat and large enough to allow ease of access around the whole sample when spread on the surface;

— place a clean protective floor covering, preferable heavy-duty plastic sheeting, on the floor of the laboratory or on the ground to protect the sample from contamination by the floor surface;

— all apparatus and tools should be clean in order to reduce the risk of cross-contamination.

6.2 Preparation for liquids, sludges and paste like substances

The following procedure should be followed, where possible, prior to all sample pre-treatment activities.

— identify an area within the a covered area or of hard standing sheltered from the effects of wind and rain, preferably flat and large enough to allow ease of access around the whole sample container(s);

— all apparatus and tools should be clean in order to reduce the risk of cross-contamination.

7 Preparing a mixed sample

7.1 Mixing granular materials

7.1.1 General

Mixing of homogenous samples and small volumes of heterogeneous material may be undertaken in the field. If a heterogeneous sample cannot be mixed in the field to produce a homogeneous sample the sample(s) should be returned to the laboratory for mechanical mixing.

— prepare a mixed sample containing equivalent quantities (m/m or v/v) of the individual increments;

— determine the quantities of the increments to be mixed together by dry weight:

NOTE It is possible for the moisture content of multiple sample increments from a single volume or mass of waste to vary considerably. In this situation mixing of the waste increments by equal weight or volume would result in a bulk sample that is biased due to under or over sampling of the individual increments. Mixing of increments with variable moisture content should therefore, where possible, be carried out in the laboratory following determination of the dry matter content of each increment. In most cases where increments are taken from the same stratum, the moisture content of individual increments should be approximately the same and increments can be mixed in the field on an equal volume or weight basis.

7.1.2 Methodology

— undertake preparations for sample pre-treatment (see 6.1);

— mix the material by forming a conical heap. Take a spade or scoopful of the material and put it on the top of the preceding one. The size of the scoop or spade should be of such size that this action should be repeated on at least 20 occasions in order to transfer the full amount of material;

The Project Manager should document the selected mixing method in the Sampling Plan.

7.2 Mixing of liquid and sludges

7.2.1 General

All samples should be returned to the laboratory without field mixing if they cannot be adequately mixed in the field to produce a homogeneous sample. Mixing of stratified samples, where the stratification must be maintained, should be undertaken in the laboratory.

7.2.2 Methodology

If mixing of liquids and sludges is required:

— undertake preparations for sample pre-treatment (see 6.2);

— the receptacle into which all samples are placed for mixing should be large enough so that there is no loss of sample during mixing;

— determine the quantities of the increments to be mixed together by volume, place in the mixing container and mix by rolling, shaking or stirring.

NOTE Mixing in containers open to the air is not appropriate for material with volatile or semi-volatile components. It is advisable that materials with such constituents are returned to the laboratory for mixing.

The Project Manager should document the selected mixing method in the Sampling Plan.

7.3 Mixing of paste like materials

7.3.1 General

Mixing of homogenous samples and small volumes of heterogeneous material may be undertaken in the field. If a heterogeneous sample cannot be mixed in the field to produce a homogeneous sample the sample(s) should be returned to the laboratory for mechanical mixing.

7.3.2 Methodology

If mixing of paste like materials is required:

— undertake preparations for sample pre-treatment (see 6.2);

— the receptacle into which all samples are placed for mixing should be large enough so that there is no loss of sample during mixing;

— determine the quantities of the increments to be mixed together by volume, place in the mixing container and mix by stirring.

NOTE Mixing in containers open to the air is not appropriate for material with volatile or semi-volatile components. It is advisable that materials with such constituents are returned to the laboratory for mixing.

8 Generic sub-sampling of mobile and viscous liquids

8.1 General

All samples should be returned to the laboratory without field sub-sampling if they cannot be adequately mixed in the field to produce a homogeneous sample. Sub-sampling of stratified samples, where the stratification must be maintained, should be undertaken in the laboratory.

8.2 Single sample method

— mix the primary sample thoroughly (by shaking, stirring or rolling);

— transfer the required quantity or quantities to a smaller container by pouring, taking care to minimise the loss of volatile components.

The Project Manager should document the selected sub-sampling method in the Sampling Plan.

8.3 Multiple sample method

— mix each sample thoroughly (see 7.2);

— pour a volume from each sample, as specified in the sampling plan, into a separate sample container, taking care to minimise loss of volatile components;

— mix the combined portions thoroughly by shaking, stirring or rolling (see 7.2).

The Project Manager should document the selected sub-sampling procedure in the Sampling Plan.

9 Generic sub-sampling of liquid and solids rendered mobile by heat

9.1 General

All samples should be returned to the laboratory without field sub-sampling if they cannot be adequately mixed in the field to produce a homogeneous sample.

9.2 Single sample method

— render the substance mobile by heat;

— see procedure 8.2.

9.3 Multiple sample method

— render the substance mobile by heat;

— see procedure 8.3.

10 Generic sub-sampling of sludges

10.1 Liquids

10.1.1 General

All samples should be returned to the laboratory without field sub-sampling if they cannot be adequately mixed in the field to produce a homogeneous sample.

10.1.2 Single sample method

See procedure 8.2.

10.1.3 Multiple sample method

See procedure 8.3.

10.2 Cakes

Follow the procedure in 12.3.

10.3 Gelatinous sludges

— undertake preparations for sample pre-treatment (see Clause 6);

— prepare a gelatinous sludge using a mixing process such as that employed for the hand or mechanical preparation of a sample with the consistency of a cement mortar;

— division into sub-samples can then be achieved as in 9.2 above;

— transfer the sub-sample to an appropriate sample container either:

a) in accordance with CEN/TR 15310-4;
b) as specified in the Sampling Plan.

The Project Manager should document the selected sub-sampling procedure in the Sampling Plan.

NOTE Heating should only be adopted where there is no impact on the composition of the sample or where it does not pose a safety hazard. Apply only sufficient heat to make the substance sufficiently mobile for mixing and sampling

11 Generic sub-sampling of paste like substances

11.1 General

All samples should be returned to the laboratory without field sub-sampling if they cannot be adequately mixed in the field to produce a homogeneous sample.

11.2 Single sample method

11.2.1 From a container

— mix in accordance with 7.3;

— using a scoop take the required amount.

11.2.2 From an extruded bar

— cut the sample into an equal number of parts as specified in the sampling plan;

— randomly select a number of pieces as instructed in the sampling plan.

11.3 Multiple sample method

Mix in accordance with 7.3.

12 Generic sub-sampling of powders, granules and small crystals

12.1 General

All samples should be returned to the laboratory without field sub-sampling if individual increments cannot be adequately mixed in the field to produce a homogeneous sample.

Information on sample sizes and appropriate reduction volumes is provided in 5.3 of CEN/TR 15310-1:2006. Sub-sampling in the field should be restricted to a minimal level that allows a sufficient reduction in the sample size to allow transportation.

The Project Manager should determine the volume or mass of sample required by the analytical laboratory and taking into account the material properties calculate the minimum size requirement of any sub-samples, and document this in the Sampling Plan.

12.2 Aggregate reduction

12.2.1 General

The Project Manager should document that aggregate reduction is required in the Sampling Plan.

The Project Manager should document the selected sub-sampling procedure in the Sampling Plan, specifically the approximate weight or volume of the final sub-sample. Information on sample sizes and appropriate reduction volumes is provided in 5.3 of CEN/TR 15310-1:2006.

12.2.2 Aggregate reduction by hand

— undertake preparations for sample pre-treatment (see Clause 6);

— place the sample on the floor covering and spread evenly to identify all large aggregates within the sample;

— using the base of a spade or the head on a sledgehammer gently reduce the size of the aggregates until all oversized material is less than or equal to the required particle size.

NOTE When a waste material is strongly aggregated the aggregates should be seen as individual "particles" when the method of sampling or pre-treatment method is not able to sample part of an aggregate. However as the particle size determines the minimum size of the sub-sample it is preferable to reduce the size of the aggregates during or prior to sub-sampling. Aggregate reduction by hand will result in a relative long and intense contact of the sample with air, this method may only be applied when sample integrity is not compromised. (see Clause 4).

12.2.3 Aggregate reduction using mechanical devices

It is also possible for size reduction of aggregate to be achieved using mechanical devices. Where the use of a mechanical device is advantageous the Project Manager should document the use of such a device in the Sampling Plan.

The mechanical device should be cleaned to prevent cross-contamination. It is possible that completed cleaning of the device is unachievable. In this instance place a small volume of the sample into the device and discard the output.

12.3 Manual and mechanical sub-sampling procedures

12.3.1 Information on the selection of sub-sampling procedures

A sample can be divided into sub-samples by manual or mechanical means. When the material is dry mechanical techniques are preferred as they can provide more representative sub-samples. A mechanical divider should be avoided when the particles in the sample are wet or behave cohesively as they may not function correctly and can block.

12.3.2 Long pile and alternate shovel method

12.3.2.1 Reduction of a bulk sample

NOTE This sub-sampling method is suitable for the reduction of samples in excess of approximately 100 kg.

— undertake preparations for sample pre-treatment (see Clause 6);

— undertake any necessary aggregate reduction to obtain a sample suitable for sub-sampling according to 12.2;

— shovel the waste sample into a conical pile on the protective floor covering, placing each shovelful on the top of the preceding one. For samples in excess of 500 kg, a mechanical shovel should be considered;

— when the entire sample is on the floor moving mix it thoroughly by turning it over to form new cone adjacent to the first. Repeat this operation three times. When forming the new cones, deposit each shovelful on the peak of the new cone in such a way that the sample runs down all sides of the cone and is evenly distributed so that different particle sizes become well mixed;

— form the cone into a long pile as follows:

  — take a shovelful from the base of the cone and spread the material into a ribbon having an initial width equal to that of a shovel and a length of 1,5 m to 3,0 m;

  — take the next shovelful from a different point at the base of the cone and spread directly over the previous shovelful, but in the opposite direction.

— repeat the above step until one long pile is formed

— discard half the sample in the following manner:

  — take a shovelful from the bottom of one end of the pile and set aside;

  — take the next shovelful immediately adjacent to the first by advancing along the side of a pile a distance equal to the width of the shovel and discard.

— again, advancing in the same direction a distance of one shovel width, take the third shovelful and add to the first.

— continue along the pile following the above procedure, discarding alternate shovelfuls so that the pile is decreased gradually and uniformly.

— repeat the above procedure (from forming the coning to halving the pile) until the retained amount of material is equal to the desired size of the sub-sample.

— transfer the sub-sample to an appropriate sample container either:

  a) in accordance with CEN/TR 15310-4;
  b) as specified in the Sampling Plan.

The Project Manager should document the selected sub-sampling procedure in the Sampling Plan.

12.3.2.2 Reduction of sampling increments

When the sampling increments have been kept separate, use the procedure described in 12.3.2.1 to reduce each increment using the same number of mixing and sub-sampling stages. If required, combine the reduced sampling increments to form a bulk sub-sample.

12.3.3 Coning and Quartering

NOTE This procedure is suitable for producing sub-samples down to approximately 1 kg.

12.3.3.1 Reduction of a bulk sample

— undertake preparations for sample pre-treatment (see Clause 6);

— undertake any necessary aggregate reduction to obtain a sample suitable for sub-sampling according to 11.2;

— shovel the sample into a conical pile on the protective floor covering, placing each shovelful on the top of the preceding one. For samples in excess of 500 kg, it is common to use a mechanical shovel. Manual handling is preferred for samples smaller than 100 kg;

— when the entire sample is on the floor mix it thoroughly by turning it over to form new cone adjacent to the first. Repeat this operation three times. When forming the new cones, deposit each shovelful on the peak of the new cone in such a way that the sample runs down all sides of the cone and is evenly distributed so that different particle sizes become well mixed;

— flatten the third cone by inserting the shovel repeatedly and vertically onto the peak of the cone to form a flat heap, which has a uniform thickness and diameter. The height should be less than or equal to the height of the shovel or spade used;

— quarter the flat heap along two diagonals intersecting at right angles using one of the following methods:

  — method 1:

    — place the centre of a sheet metal cross, at the centre of the flattened cone and press the lower edges of the metal cross through the waste sample. The height of the blades forming the cross should be greater than that of the flattened cone;

    — with the metal cross left in position /discard opposite diagonal quarters and brush clean the space they occupied;

    — remove the metal cross and mix together the remaining two quarters;

    — check if the mass of the discarded material is equal to half the mass of the (sub-) sample before subdivision, allowing a variation of ± 10% (m/m). When this condition is not met, the discarded material should be re-combined and mixed again, where after subdivision can continue;

    — cone and quarter again using the previous stages until the volume of remaining material is equal to the desired size of the sub-sample.

  — method 2:

    — quarter the flat heap along the two diagonals intersecting at right angles using a shovel inserted vertically into the material;

    — discard one pair of opposite quarters and shovel the remainder into a stockpile;

    — check if the mass of the discarded material is equal to half the mass of the (sub-) sample before subdivision, allowing a variation of ± 10% (m/m). When this condition is not met, the discarded material should be re-combined and mixed again, where after subdivision can continue;

    — repeat the process of mixing and quartering until the volume of remaining sub-sample is equal to the desired size.

— transfer the sub-sample to an appropriate sample container either:

  a) in accordance with CEN/TR 15310-4;
  b) as specified in the Sampling Plan.

The Project Manager should document the selected sub-sampling procedure in the Sampling Plan.

12.3.4 Riffling

The use of a riffle box is possible when the waste material is dry enough to allow free flow of the particles through the equipment. Division of the sample with a riffle box is commonly only practical for samples less than approximately 100 kg.

Division of the sample with a riffle box will result in a reduction of one half or one quarter (depending on riffle) at each operation.

NOTE The material should not be interlocked, aggregated or fibrous.

12.3.4.1 Reduction of a bulk sample

— undertake preparations for sample pre-treatment (see Clause 6).

— undertake any necessary aggregate reduction to obtain a sample suitable for sub-sampling according to 12.2.

— check that the slot widths of the riffle box are at least three times larger than the maximum particle size of the waste material to be sub-sampled.

— load the material in a uniform manner on a shovel or in a container, and pour the material down the centre of one of the riffle box receptacles and place the other two in position (see Annex A). It is essential that the shovel or container is held perpendicular to the axis of the box and that the material is poured evenly across the riffle to prevent biased sub-sampling.

— discard the material that falls into one of the other two receptacles.

— repeat the process of riffling until the volume of remaining waste material is equal to the desired size of the sub-sample.

— transfer the sub-sample to an appropriate sample container either:

  a) in accordance with CEN/TR 15310-4;

  b) as specified in the Sampling Plan.

The Project Manager should document the selected sub-sampling procedure in the Sampling Plan.

12.3.4.2 Reduction of sampling increments

When the sampling increments have been kept separate, use the procedure described in 12.3.4.1 to reduce each increment by the same number of riffling stages. If required, combine the reduced sampling increments to form a bulk sub-sample for delivery to the laboratory.

13 Sub-sampling coarse solids and large pieces

— if particle size reduction is required before sub-sampling can be undertaken the sample should be transported to a suitable laboratory for sample pre-treatment.

— follow the appropriate procedure in Clause 12.

NOTE Comprehensive particle size reduction procedures are particularly susceptible to the loss of fine particle components in a field environment and such procedures should only be undertaken in an appropriately equipped mobile or field laboratory to safe-guard sample integrity.

14 Incorporation in the Sampling Plan

The selected pre-treatment procedure(s) and necessary equipment should be specified by the Project Manager in the Sampling Plan; see EN 14899, prior to commencing sampling.

15 Undertake field sub-sampling procedures

Identify the appropriate sub-sampling procedure and equipment and identify in the sampling plan. The location for field sub-sampling should be selected and made fit for use by removing all materials that could influence the integrity of the (sub-)sample(s) and undertaking a thorough clean. When such preparations have been carried out, the procedure should be carried out according to the instructions provided in the sampling plan and with reference to the appropriate technique in this Technical Report. Having obtained the specified sub-sample(s), it / these should be stored and preserved in accordance with the procedures listed in CEN/TR 15310-4.

All deviations from the Sampling Plan during field sub-sampling must be first agreed with the Project Manager and then documented in the sampling record.

Annex A

Examples of equipment for sub-sampling

A.1 Riffle box

A.1 Riffle box - The number of slots of the riffle box is even and not less than eight. The width of the slots should be at least three times the upper aggregate size to avoid bridging. Taken from EN 932-1. Figure A.1 Example of a rifle box.

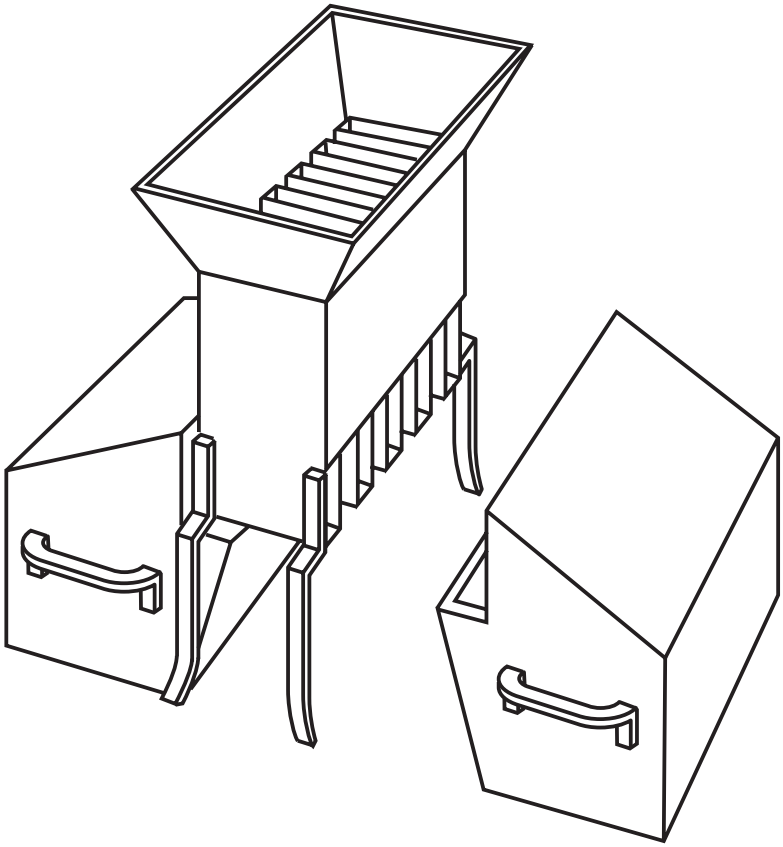

Figure A.1 — Example of a riffle box

A.2 Rotary sample divider

A rotating device divides the sample into sub-samples which are representative of the bulk sample. The rotating dividers consist of a number of prismatic containers, of equal size, mounted round the periphery of a circle which pass under the falling stream of the sample fed from a hopper mounted above the turntable, and off-set from the centre.

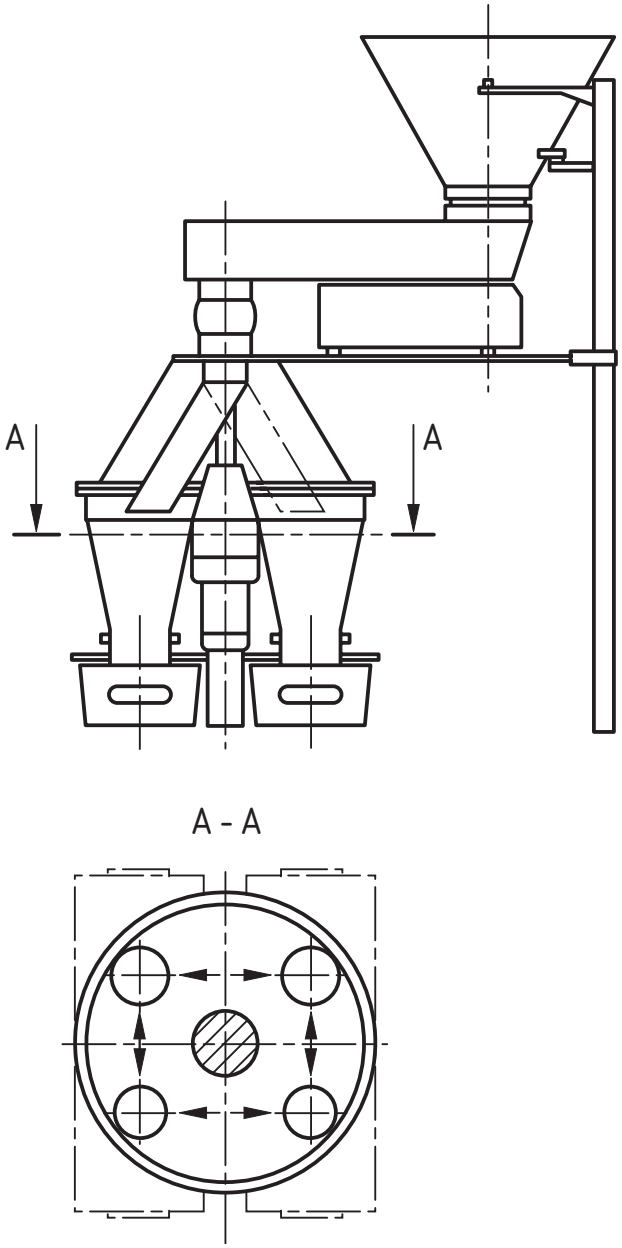

Figure A.2 — Example of a sample divider for large particle sized solid wastes (after EN 932-1)

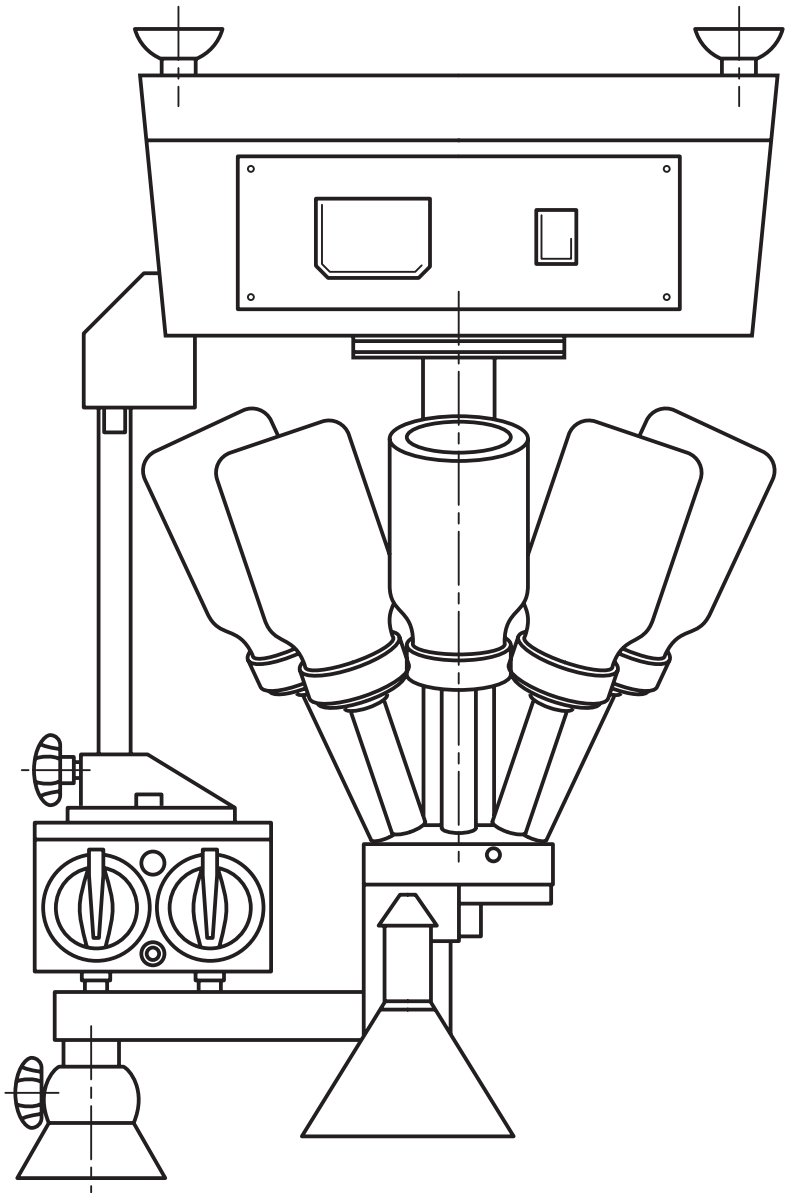

Figure A.3 — Example of a rotary sample divider for small particle sized solid wastes (after EN 932-1)

A.3 Tyler divider

In a Tyler divider the material flows over the plate and is reduced successively in steps at each station down the plate by means of slots or holes placed in the plate. Each plate reduces the amount of material passing by one half. (No figure)

A.4 Sheet metal cross

A sheet metal cross is made with four blades joined together at the centre at 90° to each other. (No figure)

Bibliography

EN 14899:2005, *Characterization of waste - Sampling of waste materials - Framework for the preparation and application of a Sampling Plan*

CEN/TR 15310-1:2006, *Characterization of waste – Sampling of waste materials - Part 1: Guidance on selection and application of criteria for sampling under various conditions*

CEN/TR 15310-2:2006, *Characterization of waste – Sampling of waste materials – Part 2: Guidance on sampling techniques*

CEN/TR 15310–4:2006, *Characterization of waste – Sampling of waste materials – Part 4 : Guidance on procedures for sample packaging, storage, preservation, transport and delivery*

CEN/TR 15310–5:2006, *Characterization of waste – Sampling of waste materials – Part 5 : Guidance on the process of defining the Sampling Plan*

EN 932-1, *Tests for general properties of aggregates - Part 1: Methods for sampling*

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