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Characterization of waste - Sampling of waste materials - Part 3: Guidance on procedures for sub-sampling in the field

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

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Caractérisation des déchets - Prélèvement des déchets - Partie 3: Guide relatif aux procédures de sous-échantillonnage sur le terrain

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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.

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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.

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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.

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1) Define the Sampling Plan;

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

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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.

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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*

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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

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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)

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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]

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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.

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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.

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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 .

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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.