



SLOVENSKI STANDARD
oSIST prEN 15442:2009
01-julij-2009

HfXbU'UHf bUj bU[cf]j U!`A YfcXY'nUj ncf Yb`Y

Solid recovered fuels - Methods for sampling

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: prEN 15442

<https://standards.iteh.ai/catalog/standards/sist/453defec-a56c-48c4-9754-783c2549239f/sist-en-15442-2011>

ICS:

75.160.10 Trda goriva

Solid fuels

oSIST prEN 15442:2009

en

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 15442

May 2009

ICS 75.160.10

Will supersede CEN/TS 15442:2006

English Version

Solid recovered fuels - Methods for sampling

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 343.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, 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.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

<https://standards.cen.eu/catalog/standards/sist/453defec-a56c-48c4-9754-783c2549239f/sist-en-15442-2011>



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Introduction	6
1 Scope	8
2 Normative references	8
3 Terms and definitions	8
4 Symbols and abbreviated terms	11
5 Principle	12
6 Development of a sampling plan	12
6.1 Principle	12
6.2 Definition of overall objectives	14
6.3 Definition of a lot and determining lot size	14
6.3.1 General	14
6.3.2 Definition of a lot in case sampling from a material flow	15
6.3.3 Definition of a lot in case of transport by a vehicle	15
6.3.4 Definition of a lot in case of transport by ship	15
6.3.5 Definition of a lot in case of sampling from a static lot	15
6.4 Determination of the sampling procedure	15
6.5 Determination of the number of increments	15
6.6 Determination of minimum sample size	16
6.7 Determination of the minimum increment size	16
6.7.1 Determination of minimum increment size for material flows	16
6.7.2 Determination of the minimum increment size for static lots or vehicle	16
6.8 Determination of the effective increment and sample sizes	16
6.8.1 Determination of the effective increment size	16
6.8.2 Determination of the effective sample size	16
6.9 Selection of distribution of increments over a lot	17
6.9.1 Determination of the distribution of the increments when sampling from a material flow	17
6.9.2 Determination of the distribution of the increments when sampling from a vehicle	17
6.9.3 Implementation of sampling from a static lot	18
7 Implementation of the sampling plan	19
8 Handling and storage of samples	20
9 Precision	20
Annex A (normative) Step-by-step plan for the development of a sampling plan	21
A.1 Introduction	21
A.2 Principle	21
A.3 Step-by-step plan	21
Annex B (informative) Guideline for a sampling plan	24
B.1 Introduction	24
B.2 Form for the sampling plan	24
Annex C (normative) Sampling equipment and implements	29
C.1 Introduction	29
C.2 Principle	29
C.3 Selection of an apparatus	29
C.4 Examples for sampling from a moving conveyor or drop flow	29
C.5 Sampling frame	32
C.6 Sampling scoop	33
C.7 Mechanical probe	34

Annex D (normative) Determination of minimum sample size	36
D.1 Introduction	36
D.2 Principle	36
D.3 Determination of factors necessary for the minimum sample size	36
D.3.1 General	36
D.3.2 Determination of the nominal top size	36
D.3.3 Determination of the shape factor	36
D.3.4 Determination of the bulk density	37
D.3.5 The distribution factor g	37
D.3.6 The factor p	37
D.3.7 The coefficient of variation cv	37
D.4 Calculation of the minimum sample size	38
D.5 Quick determination of minimum sample size	39
D.5.1 Quick determination of minimum sample size for fluff-type solid recovered fuels	39
D.5.2 Quick determination of minimum sample size for granular solid recovered fuels	39
Annex E (normative) Determination of minimum increment size for sampling from material flows	41
E.1 Introduction	41
E.2 Principle	41
E.3 Determination of minimum increment size for mechanical sampling from a drop flow	41
E.4 Determination of minimum increment size for manual sampling from a drop flow	42
E.5 Determination of minimum increment size for sampling from a conveyor	43
Annex F (normative) Determination of minimum increment size for sampling from static lots or vehicles	45
F.1 Introduction	45
F.2 Principle	45
F.3 Procedure	45
Annex G (normative) Implementation of sampling plan from a material flow	46
G.1 Introduction	46
G.2 Principle	46
G.3 Procedure verification of sampling aspects	46
G.4 Procedure: Mechanical or manual sampling from the drop flow	46
G.5 Procedure: Mechanical sampling from a moving conveyor	48
G.6 Procedure: Manual sampling from a stationary conveyor	48
Annex H (normative) Implementation of the sampling plan from a static lot or vehicle	50
H.1 Introduction	50
H.2 Principle	50
H.3 Procedure	50
H.4 Implementation of sampling in locations chosen in a stratified random way	51
H.5 Implementation of sampling in locations chosen in a stratified way after rearranging or moving part of the lot	51
Annex I (normative) Minimum sample size required for analysis	52
I.1 Introduction	52
I.2 Principle	52
I.3 Procedure	52
Annex J (normative) Standard sampling plans for common situations	57
J.1 Introduction	57
J.2 Sampling of granular SRF <25 mm from a moving conveyor	57
J.3 Sampling of granular SRF <25 mm from a static lot	61
J.4 Sampling of granular SRF <25 mm from a vehicle	64
Annex K (informative) Additional information about precision	68
K.1 Introduction	68
K.2 Scope	68
K.3 Trueness	68
K.4 Repeatability and reproducibility	68
K.5 Robustness	69

prEN 15442:2009 (E)

Annex L (informative) Distribution of increments.....	71
L.1 Scope	71
L.2 Stratified sampling.....	71
L.3 Stratified random sampling	72
Bibliography	74

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 15442:2011

<https://standards.iteh.ai/catalog/standards/sist/453defec-a56c-48c4-9754-783c2549239f/sist-en-15442-2011>

Foreword

This document (prEN 15442:2009) has been prepared by Technical Committee CEN/TC 343 “Solid recovered fuels”, the secretariat of which is held by SFS.

This document is currently submitted to the CEN Enquiry.

This document will supersede CEN/TS 15442:2006.

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

prEN 15442, *Solid recovered fuels — Methods for sampling*

prEN 15443, *Solid recovered fuels — Methods for laboratory sample preparation*

prEN 15413, *Solid recovered fuels — Methods for the preparation of the test sample from the laboratory sample*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 15442:2011

<https://standards.iteh.ai/catalog/standards/sist/453defec-a56c-48c4-9754-783c2549239f/sist-en-15442-2011>

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 fulfil them are detailed in an overall sampling plan. After a sampling plan has been prepared the sampling of solid recovered fuel 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 Standard is primarily geared toward laboratories, producers, suppliers and purchasers of solid recovered fuels, but is also useful for the authorities and inspection organizations.

<https://standards.iteh.ai/catalog/standards/sist/453defec-a56c-48c4-9754-783c2549239f/sist-en-15442-2011>

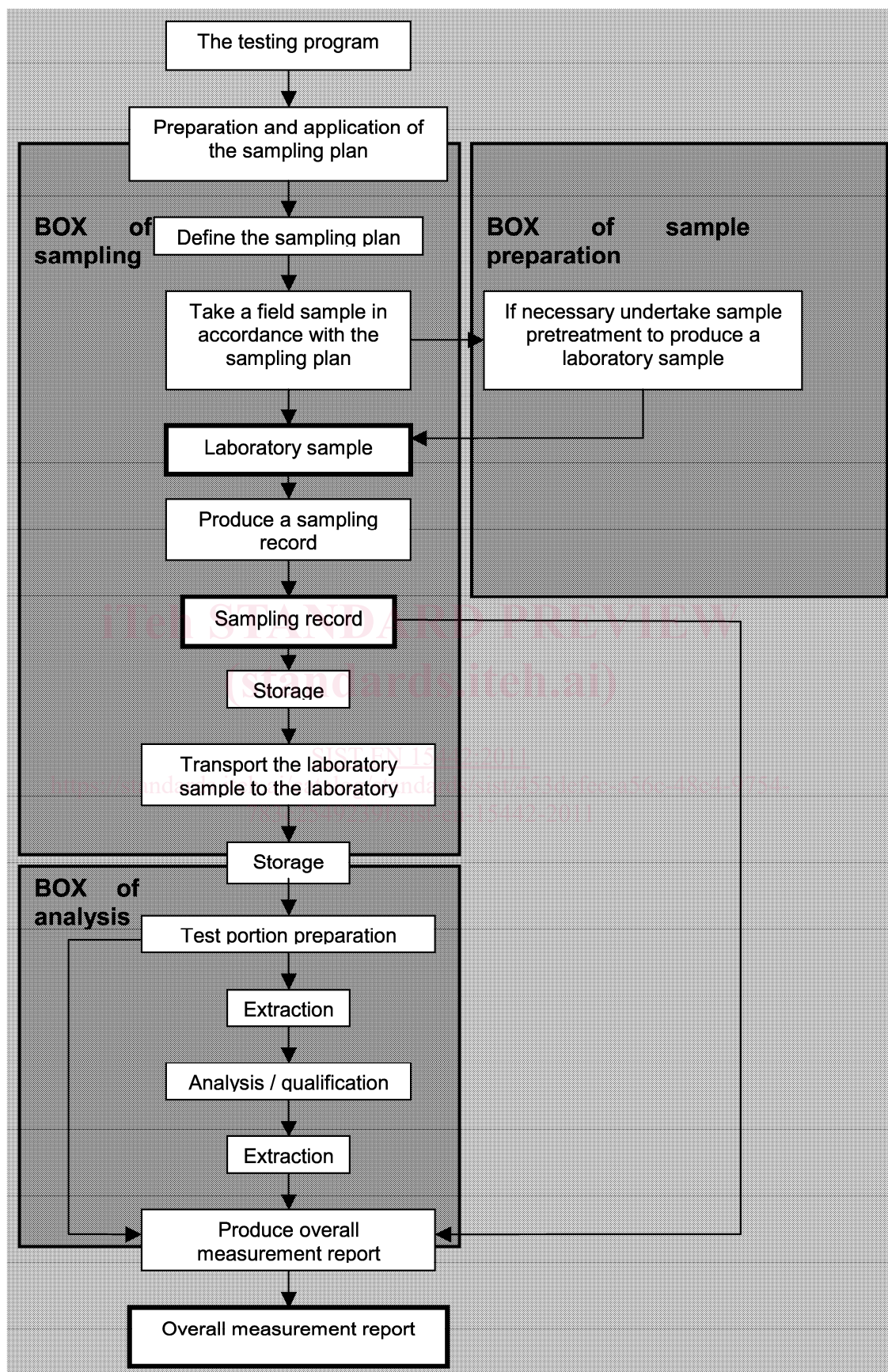


Figure 1 — Links between the essential elements of a testing program

prEN 15442:2009 (E)

Standards for sampling of solid biofuels are available from Technical Committee CEN/TC 335 "Solid biofuels" (1) (2) (3). A European standard and a Technical Report for the sampling for the purpose of the characterization of waste are available from CEN/TC 292 (4) (5).

1 Scope

This Standard describes 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.

prEN 15357, *Solid recovered fuels — Terminology, definitions and descriptions*

prEN 15401, *Solid recovered fuels — Methods for the determination of bulk density (revision of CEN/TS 15401 as WI 00343047)*

prEN 15413, *Solid recovered fuels — Methods for the preparation of the test sample from the laboratory sample (revision of CEN/TS 15413 as WI 00343062)*

prEN 15415, *Solid recovered fuels — Determination of particle size distribution by screen method (revision of CEN/TS 15415 as WIs 00343063, 00343064, 00343065)*

3 Terms and definitions

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

**3.1
coefficient of variation**

an 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 [13]

**3.2
duplicate sample**

Two samples taken under comparable conditions. This selection may 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

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

NOTE Adapted from ISO 13909:2002

NOTE The different types of waste are identified by the number of the European Waste List (6).

3.10**minimum increment size**

minimum dimension or size of the increment that shall be 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 ultimate increment size multiplied by the number of increments, and is linked directly to the nominal top size.

prEN 15442:2009 (E)**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.

[ISO 3534-2]

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

[ISO 3534-2]

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

3.16**reproducibility**

precision under reproducibility conditions

[ISO 3534-2]

NOTE 1 Reproducibility can be expressed quantitatively in terms of the dispersion characteristics of the results.

NOTE 2 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

[ISO 3534-1]

3.20**sampling plan**

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

[ISO 11074-2:1998]

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

[ISO 11074-2:1998]

3.22**shape factor**

s

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. Within each stratum, the samples are taken randomly

3.26**trueness**

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

[ISO 3534-2]

NOTE 1 The measure of trueness is usually expressed in terms of bias.

NOTE 2 Trueness is sometimes referred to as “accuracy of the mean”. This usage is not recommended.

NOTE 3 In practice, the accepted reference value is substituted for the true value.

NOTE 4 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

prEN 15442:2009 (E)

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
s	is the shape factor, in m ³ /m ³
V	is volume
v	is conveyor velocity, in m/s

iTeh STANDARD PREVIEW
(standards.iteh.ai)

5 Principle

SIST EN 15442:2011

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 according to this Clause and Annex A simplified sampling plans for three common standard situations. Figure 2 determines whether a simplified sampling plan can be used.

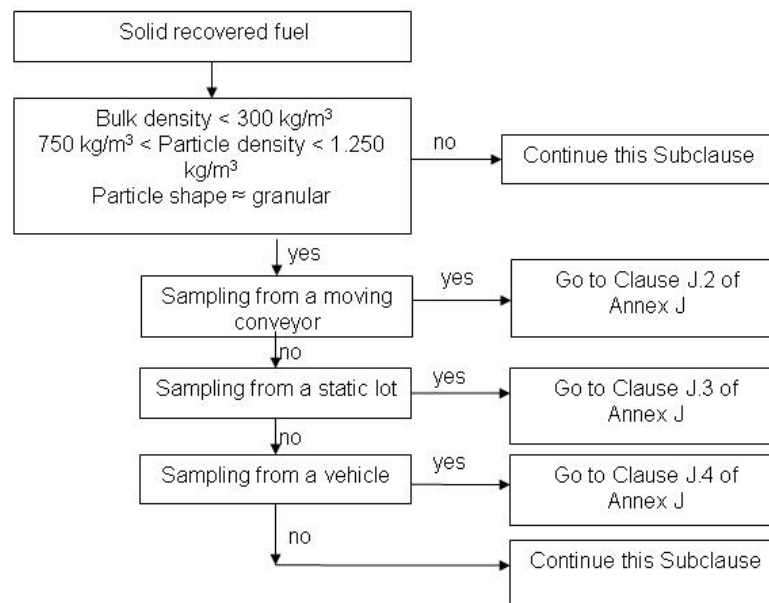


Figure 2 — Check for the standard sampling plan

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.