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Soil quality — Sampling —

Part 8: Guidance on sampling of stockpiles

Qualité du sol — Échantillonnage —

Partie 8: Lignes directrices pour l'échantillonnage des stocks de réserve

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Foreword

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

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10381-8 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 2, *Sampling*.

ISO 10381 consists of the following parts, under the general title *Soil quality — Sampling*:

— *Part 1: Guidance on the design of sampling programmes*

— *Part 2: Guidance on sampling techniques*

— *Part 3: Guidance on safety*

— *Part 4: Guidance on the procedure for investigation of natural, near-natural and cultivated sites*

— *Part 5: Guidance on the procedure for the investigation of urban and industrial sites with regard to soil contamination*

— *Part 6: Guidance on the collection, handling and storage of soil for the assessment of aerobic microbial processes in the laboratory*

— *Part 7: Guidance on sampling of soil gas*

— *Part 8: Guidance on sampling of stockpiles*

This corrected version of ISO 10381-2:2006 incorporates the following corrections.

Clause 3

[ISO 11074-2:1995] was changed to [ISO 11074:2005].

In 3.26, Note 3 was deleted.

Subclause 5.5, **Table 1**

In the third column following “Sampling technique”, “other” was replaced by “different”.

Subclause 6.5.5

In the second sentence of the second paragraph “shaded region” was replaced by “central region”.

Subclause 8.2.3

In the last line of g), “Note 3” was replaced by “item c) 3)”.

Subclause D.4.4

In Equation D.1, the horizontal line of the square-root sign was extended to the right to include “+ CV analysis”.

Subclause H.1.4.4

In the line before Equation (H.5), “(H.4)” was replaced by “(H.5)”.

Subclause H.2.1

In the first line, “less” was replaced by “little”.

In addition, minor editorial changes were made. These changes do not alter the meaning of the text.

Introduction

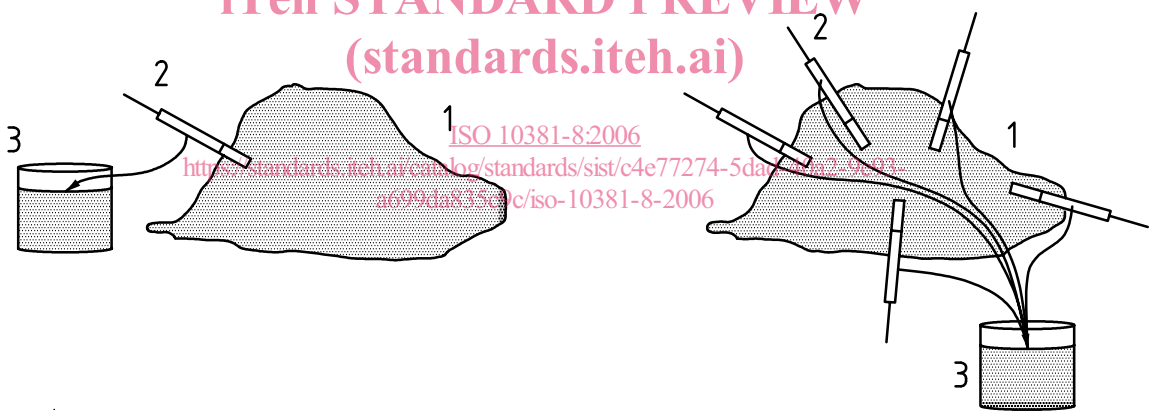
This part of ISO 10381 describes the methods to be applied when sampling soil from stockpiles. The general character of this part of ISO 10381 is a guideline. Nevertheless, many aspects of the sampling of stockpiles are based on well established methods and consequently are described in a prescriptive manner.

This part of ISO 10381 only includes the sampling of the soil material itself, i.e. the solid phase. It defines the different steps in sampling soil from a stockpile and gives instructions on how these steps should be carried out for specific situations.

This part of ISO 10381 is basically a code of practice. It describes what activities, circumstances and requirements should be addressed when sampling soil from stockpiles. As the circumstances can vary enormously, no detailed instructions on how samples should be taken in a specific situation can be given.

For a good understanding of this part of ISO 10381, the distinction between the terms “increment” (3.5), “sample” (3.16) and “composite sample” (3.4) is essential. Figure 1 illustrates this point.

An increment is obtained by a single operation of a sampling device and is per definition put together with other increments in a composite sample. A sample can also be obtained by a single operation of a sampling device, but the obtained material is packed and analysed as an entity.



a) Only material of one sampling action in sample container: sample

b) Two or more sampling actions: gathered material in one sample container: composite sample
Material of each individual action: increment

Key

1 stockpile
2 sampling device
3 sample container

Figure 1 — Sample, composite sample and increment

Soil quality — Sampling —

Part 8: Guidance on sampling of stockpiles

1 Scope

This part of ISO 10381 defines the methods that should be applied when sampling soil from stockpiles. This part of ISO 10381 only includes the sampling of the soil material itself, i.e. the solid phase. It applies to the sampling of soil material that is present in a stockpile, generally a heap of soil material that is lying above the surface of the location.

The underlying reason for sampling the soil can differ widely as can the subsequent analysis on the obtained samples. This part of ISO 10381 therefore gives guidance on the various aspects that, together, describe the sampling activity:

— the definition of a sampling plan;

— the choice of an adequate sampling strategy;

— the sampling technique to be applied;

— the sample pretreatment directly after sampling (when necessary);

— the packing, preservation, storing, transport and delivery of the sample.

Given the wide differences in circumstances for all of the above-mentioned sampling steps, this part of ISO 10381 provides information on how to obtain clear and simple instructions for the sampling personnel.

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.

ISO 10381-1:2002, *Soil quality — Sampling — Part 1: Guidance on the design of sampling programmes*

ISO 10381-3:2001, *Soil quality — Sampling — Part 3: Guidance on safety*

ISO 10381-5:2005, *Soil quality — Sampling — Part 5: Guidance on the procedure for the investigation of urban and industrial sites with regard to soil contamination*

ISO 11464, *Soil quality — Pretreatment of samples for physico-chemical analysis*

ISO 14507, *Soil quality — Pretreatment of samples for determination of organic contaminants*

3 Terms and definitions

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

3.1
analytical sample
portion of material, resulting from the original sample or composite sample by means of an appropriate method of sample pretreatment, and having the size (volume/mass) necessary for the desired testing or analysis

3.2
actual increment size
amount of material that is present in an increment

NOTE The actual increment size is determined by the minimum increment size, the amount of material needed for the tests or analysis and the number of increments in a composite sample.

3.3
actual sample size
amount of material that is present in the sample

NOTE The actual sample size is determined by the minimum sample size, the amount of material needed for the tests or analysis, the size of the sampling equipment and, for composite samples, the number of increments and the actual size of the increments.

3.4
composite sample
two or more increments/subsamples 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 11074:2005]

3.5
increment
sampling unit collected by a single operation of a sampling device and used in a composite sample

[ISO 11074:2005]

NOTE When an individual portion of material is collected in a single operation of a sampling device and this portion is analysed as an individual unit, it is per definition a sample.

3.6
involved parties
individuals involved in the (iterative) process of defining and executing the sampling programme

3.7
judgemental sampling
sampling using methods identified by prior agreement with all involved parties, without sampling in accordance with probabilistic sampling

NOTE Although in general agreement of all parties should be sought, in specific situations some parties are to be considered as more important than others. Whenever there is a hierarchical relation between the different parties, this should be taken into account when no general agreement can be established.

3.8
maximum particle size
D_{95}
particle size that concurs with the mesh width of a sieve on which a maximum of 5 % (mass fraction) of the material remains

3.9
minimum increment size
minimum amount of material in an increment obtained with a sampling device for which the conditions of probabilistic sampling apply

NOTE The fact that every particle in the material to be sampled shall have the same probability of being part of a sample results in requirements for the size of the sampling equipment. These requirements determine the amount of material that is obtained with a single sampling operation.

3.10
minimum sample size
minimum amount of material in a sample for which the variability caused by the individual particles within that material has a negligible effect

NOTE The minimum sample size is calculated based on an equation in which different factors result in an estimation of the minimum sample size. One of these factors is the variability that is accepted to be caused by the differences between individual particles. When a large amount of variability is chosen for this factor, there will no longer be a "negligible effect" as mentioned in the definition. However, in normal circumstances, a low value will be chosen, accepting only a relatively small amount of variability.

3.11
particle size reduction
procedure to reduce the particle size of the whole (sub)sample through grinding or crushing without reducing the sample size (mass)

3.12
population
totality of items under consideration

[ISO 11074:2005]

NOTE In the case of a random variable, the probability distribution is considered to define the population of that variable.

3.13
probabilistic sampling
sampling to ensure that each particle or element in the stockpile (population) has an equal chance of being part of the sample

3.14
project manager
individual responsible for the development of both the sampling plan and the sampling programme

3.15
primary goal
definition of the sampling in short, general statements, giving direction towards the type of sampling, but still lacking the necessary detail to define a sampling plan

3.16
sample
portion of soil material selected from a larger quantity of material

[ISO 11074:2005]

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

3.17
sampler
person or group of persons carrying out the sampling procedures at the sampling locality

[ISO 11074:2005]

3.18
sample division
procedure through which subsamples of smaller size than the original sample are obtained without reducing the particle size of the individual particles

3.19
sample pretreatment
collective noun for all procedures used for conditioning a soil sample to a defined state which allows subsequent examination or analysis or long-term storage

[ISO 11074:2005]

NOTE Sample pretreatment includes, e.g. mixing, splitting, drying, crushing and stabilization.

3.20
sampling goal
technical description of the purpose of sampling

3.21
sampling plan
all information pertinent to a particular sampling activity

NOTE The sampling plan provides the sampler with a predetermined procedure for the selection, withdrawal, on-site pretreatment, preservation and transportation of the portions to be removed from a stockpile (population) as a sample.

3.22
sampling programme
total sampling operation, from the first step in which the purpose of sampling is defined to the last step in which the analytical results are compared with the relevant test level(s)

3.23
sampling technique
correct appliance of appropriate sampling equipment to obtain samples as specified in the sampling plan

NOTE The manner of selection of the sampling technique should be described in the sampling plan.

3.24
secondary goals
detailed definition of the technical aspects necessary for defining the sampling

NOTE The secondary goals address items such as the population to be sampled, the components to be determined, the statistical parameter to be determined, the scale of sampling and the desired precision and confidence.

3.25
stockpile
temporary heap of material

NOTE 1 Within the scope of this part of ISO 10381, the stockpile contains soil material.

NOTE 2 The soil material can be stored in a loosely dumped heap, can be lying in a pre-defined depot, above or below the surface of the location, etc.

3.26
subsample
sample obtained by procedures in which the items of interest are randomly distributed in parts of equal or unequal size

[ISO 11074:2005]

NOTE 1 A subsample may be:

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

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

c) the final unit of multistage sampling.

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

4 Principle

A sampling plan shall be defined and this is carried out mainly as a desk operation. However, the designer of the sampling plan shall have sampling experience and be aware of the specific circumstances of the objectives and location of the sampling. Where knowledge of the site is insufficient, a site visit may be necessary before designing the sampling plan.

The sampling plan design shall include the consideration and formulation of the sampling strategy. This is important as the strategy shall ensure that the samples obtained from the stockpile are representative. Thus, there are two points to be considered in formulating the sampling plan: 1) the sampling strategy; 2) the sampling techniques.

The aim of the sampling strategy is to ensure that the requirements of probabilistic sampling are achieved. This means that all the particles in a stockpile have an equal chance of being present in the sample. This truly representative sample can only be achieved when all the requirements of probabilistic sampling are met. In practice, this may not be possible, in which case sampling should be carried out following the most practicable methods to achieve the sampling objectives.

The sampling plan shall include the sampling equipment chosen, and the sampler should have the necessary experience to ensure correct use of that equipment.

The sampling plan, when completed, should be given to the sampler before sampling commences, though some alterations may be necessary due to situations encountered onsite. Small alterations to the sampling plan may be made in the field without consulting the designer of the sampling plan.

In some cases, the sampling will result in samples which are too large to take to the laboratory and sample pretreatment in the field shall be necessary. There are two basic conditions for pretreatment in the field. Firstly, the sample should not be changed in a way that will affect the subsequent examination, i.e. contamination of the sample and/or involuntary loss of material or components should be avoided. Secondly, there should be no reduction in particle size since that process requires well-defined conditions which can not be achieved in the field and particle size reduction is restricted to being a laboratory operation.

When the samples have been taken and, if necessary, pretreated, they should be packaged so that the characteristics are protected. The packaging and any preservation necessary depend on the characteristics which are to be preserved. Preservation of soil samples shall involve two basic methods: 1) cool storage; 2) dark storage.

This part of ISO 10381 gives guidance on the aspects to be considered when storing the samples prior to analysis. This includes storage before and during transport, and storage in the laboratory prior to sample preparation for analysis.