



SLOVENSKI STANDARD
SIST ISO 10381-1:2006

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Soil quality -- Sampling -- Part 1: Guidance on the design of sampling programmes

ITeH STANDARD PREVIEW

Qualité du sol -- Échantillonnage -- Partie 1: Lignes directrices pour l'établissement des programmes d'échantillonnage

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ICS:

13.080.05	Preiskava tal na splošno	Examination of soils in general
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Soil quality — Sampling —

Part 1: Guidance on the design of sampling programmes

Qualité du sol — Échantillonnage —

*Partie 1: Lignes directrices pour l'établissement des programmes
d'échantillonnage*

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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 10381-1 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 investigation of soil contamination of urban and industrial sites*
- *Part 6: Guidance on the collection, handling and storage of soil for the assessment of aerobic microbial processes in the laboratory*

Introduction

This part of ISO 10381 is one of a set of International Standards intended to be used in conjunction with each other as appropriate and necessary. ISO 10381 (all parts) deals with sampling procedures for the various purposes of soil investigation.

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Soil quality — Sampling —

Part 1: Guidance on the design of sampling programmes

1 Scope

This part of ISO 10381 sets out the general principles to be applied in the design of sampling programmes for the purpose of characterizing and controlling soil quality and identifying sources and effects of contamination of soil and related material, with emphasis on

- procedures required to locate points from which samples may be taken for examination or at which instruments may be installed for *in situ* measurement including statistical implications,
- procedures for determining how much sample to collect and whether to combine samples,
- methods of collecting samples,
- methods for containing, storing and transporting samples to prevent deterioration/contamination.

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2 Normative references

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

ISO 10381-4, *Soil quality — Sampling — Part 4: Guidance on the procedure for investigation of natural, near-natural and cultivated sites*

ISO 10381-5, *Soil quality — Sampling — Part 5: Guidance on investigation of soil contamination of urban and industrial sites*

ISO 10381-6, *Soil quality — Sampling — Part 6: Guidance on the collection, handling and storage of soil for the assessment of aerobic microbial processes in the laboratory*

ISO 11074-2, *Soil quality — Vocabulary — Part 2: Terms and definitions relating to sampling*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074-2 apply.

ISO 10381-1:2002(E)**4 Planning the sampling programme****4.1 General**

Samples are collected and examined primarily to determine their physical, chemical, biological and radiological properties. This clause outlines the more important factors which should be considered when devising a sampling programme for soil and related material. More detailed information is given in subsequent clauses.

Whenever a volume of soil is to be characterized, it is generally not possible to examine the whole and it is therefore necessary to take samples. The samples collected should be as representative as possible of the whole to be characterized, and all precautions should be taken to ensure that, as far as possible, the samples do not undergo any changes in the interval between sampling and examination. The sampling of multiphase systems, such as soils containing water or other liquids, gases, biological material, radionuclides or other solids not naturally belonging to soil (e.g. waste materials), can present special problems. In addition, examination for some physical soil parameters may require so-called undisturbed soil samples for correct execution of the relevant measurement.

Before any sampling programme is devised, it is important that the objectives be first established since they are the major determining factors, e.g. the position and density of sampling points, time of sampling, sampling procedures, subsequent treatment of samples and analytical requirements. The details of a sampling programme depend on whether the information needed is the average value, the distribution or the variability of given soil parameters.

Some consideration should also be given to the degree of detail and precision required and also to the manner in which the results are to be expressed and presented, for example concentrations of chemical substances, maximum and minimum values, arithmetic means, median values, etc. Additionally, a list of parameters of interest should be compiled and the relevant analytical procedures consulted, since these will usually give guidance on precautions to be observed during sampling and subsequent handling of soil samples.

It may often be necessary to carry out an exploratory sampling and analysis programme before the final objectives can be defined. It is important to take into account all relevant data from previous programmes at the same or similar locations and other information on local conditions. Previous personal experience can also be very valuable. Time and money allocated to the design of a proper sampling programme is usually well justified because it ensures that the required information is obtained efficiently and economically.

It is emphasized that whether soil investigations completely achieve their objectives depends mainly on the design and execution of an appropriate sampling programme.

The main points about which decisions shall be made in the design of a sampling programme are listed below in 4.2 to 4.7. The relevant references are indicated.

4.2 Defining the objective

The following should be considered when defining the objective:

- a) delineation of area(s) to be investigated;
- b) setting of objectives for the whole investigation;
- c) listing of parameters to be determined;
- d) listing of other information required to enable interpretation of results;
- e) content of sample report;
- f) decisions regarding contractual arrangements for sampling;
- g) management arrangements;
- h) estimation of costs.

4.3 Preliminary information

The following questions may help in the choice of preliminary information:

- a) What is already known?
- b) What can be made easily available?
- c) Who is to be contacted for certain (historical) sources?
- d) Are there any legal problems, e.g. entering the site?
- e) What should be observed on first visit to the site?

For details see Clause 6 and ISO 10381-4, ISO 10381-5 and ISO 10381-6.

4.4 Strategy

Decisions regarding the following factors are usually involved in a sampling strategy:

- a) sampling patterns;
- b) sampling points;
- c) depth of sampling;
- d) type of samples to be obtained;
- e) sampling methods to be employed, e.g. borings, drillings, trial pits, etc.

For details see Clause 10 and ISO 10381-4, ISO 10381-5 and ISO 10381-6.

4.5 Sampling

The following procedures are involved in planning the sampling:

- a) coordination with personnel responsible for the sample preparation and analysis;
- b) choice of suitable sampling tools;
- c) choice of suitable storage;
- d) choice of suitable preservation measures;
- e) choice of suitable labelling and transportation;
- f) field tests to be carried out, if specified.

For details see Clauses 7, 8, 10 and ISO 10381-2, ISO 10381-4, ISO 10381-5 and ISO 10381-6.

4.6 Safety

The following safety aspects need to be considered:

- a) all necessary safety precautions at the site;
- b) informing landowners, construction authorities, local authorities;

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- c) data protection efforts;
- d) requirements for disposal of surplus soil or test material.

For details see Clause 9 and ISO 10381-2, ISO 10381-3, ISO 10381-4, ISO 10381-5 and ISO 10381-6.

4.7 Sampling report

The sampling report should meet the basic content as specified in this part of ISO 10381. Additional information required should be clearly specified by the client and laid down in a written contract. Any later deviation should be justified to avoid deficiencies with regard to evaluation of the investigation and to avoid conflicts between business partners.

For details see Clauses 11, 12, 13 and ISO 10381-4, ISO 10381-5 and ISO 10381-6.

5 Objectives of sampling**5.1 General****5.1.1 Principal objectives**

The four principal objectives of sampling of soil may be distinguished as follows:

- sampling for determination of general soil quality,
- sampling for characterization purposes in preparation of soil maps,
- sampling to support legal or regulatory action,
- sampling as part of a hazard or risk assessment.

These four principal objectives are discussed further below.

The utilization of the soil and site is of varying importance depending on the primary objective of an investigation. For example, while consideration of past, present and future site use is particularly relevant to sampling for risk assessment, it is less important to soil mapping where the focus is on description rather than evaluation of a soil. Objectives such as soil quality assessment, land appraisal and soil monitoring take utilization into account to varying degrees.

The results obtained from sampling campaigns to assess soil quality for mapping may indicate a need for further investigation, for example if contamination is detected which indicates a need for identification and assessment of potential hazards and risks.

5.1.2 Sampling for determination of general soil quality

Such sampling is typically carried out at (irregular) time intervals to determine the quality of the soil for a particular purpose e.g. for agriculture. As such, it tends to concentrate on factors such as nutrient status, pH, organic matter content, trace element concentrations and physical factors, which provide a measure of current quality and which are amenable to manipulation. Such sampling is usually carried out within the main rooting zone and also at greater depths but sometimes without exact distinction of horizons or layers.

The guidance given in ISO 10381-4 is particularly relevant.

5.1.3 Sampling for preparation of soil maps

Soil maps may be used in soil description, land appraisal (taxation), and for soil monitoring sites to establish the basic information on the genesis and distribution of naturally occurring or man-made soils, their chemical, mineralogical, biological composition, and their physical properties at selected locations. The preparation of soil maps involves installation of trial pits or core sampling with detailed consideration of soil layers and horizons. Special strategies are required to preserve samples in their original physical and chemical condition. Sampling is nearly always a one-off procedure.

The guidance given in ISO 10381-4 is particularly relevant.

5.1.4 Sampling to support legal or regulatory action

Sampling may be required to establish baseline conditions prior to an activity which might affect the composition or quality of soil, or it may be required following an anthropogenic effect such as the input of an undesirable material which may be from a point or a diffuse source.

Sampling strategies need to be developed on a site-specific basis.

To adequately support legal or regulatory action, particular attention should be paid to all aspects of quality assurance including for example "chain-of-custody procedures".

The guidance given in ISO 10381-5 is particularly relevant. That in ISO 10381-4 may also be relevant.

5.1.5 Sampling for hazard and risk assessment

When land is contaminated with chemicals and other substances that are potentially harmful to human health and safety or to the environment, it may be necessary to carry out an investigation as a part of a hazard and/or risk assessment, i.e. to determine the nature and extent of contamination, to identify hazards associated with the contamination, to identify potential targets and routes of exposure, and to evaluate the risks relating to current and future use of the site and neighbouring land. A sampling programme for risk assessment (in this context: phase I, phase II, phase III and phase IV investigation) may have to comply with legal or regulatory requirements (see 5.1.3), and careful attention to sample integrity is recommended. Sampling strategies should be developed on a site-specific basis.

The guidance given in ISO 10381-5 is particularly relevant. That in ISO 10381-4 may also be relevant.

5.2 Specific objectives

5.2.1 General

Depending on the principal objective(s), it is usually necessary to determine, for the body of soil or part thereof:

- the nature, concentrations and distribution of naturally occurring substances,
- the nature, concentrations and distribution of contaminants (extraneous substances),
- the physical properties and variations,
- the presence and distribution of biological species of interest.

It is often necessary to take into account changes in the above parameters with time, caused by migration, atmospheric conditions and land/soil use.

Some detailed objectives are suggested in the subclauses below. The list is not exhaustive.