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Soil quality — Sampling —

Part 102: Selection and application of sampling techniques

Qualité du sol — Échantillonnage —

Partie 102: Choix et application des techniques 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 2, *Sampling*.

This first edition of ISO 18400-102, together with ISO 18400-104, ISO 18400-105 and ISO 18400-206, cancels and replaces ISO 10381-2:2002 and ISO 10381-6:2009, which have been technically and structurally revised. The new ISO 18400 series is based on a modular structure and cannot be compared to ISO 10381-2 and ISO 10381-6 clause by clause.

A list of all parts in the ISO 18400 series can be found on the ISO website.

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Introduction

This document is one of a group of International Standards intended to be used in conjunction with each other where necessary. It deals with various aspects of sampling for the purposes of soil investigation including agricultural, forestry, and contamination investigations, but is not applicable to investigations for geotechnical purposes. These are dealt with in the ISO 22475 series.

ISO 22475-1 specifies the technical principles for the execution of sampling and groundwater measurements for geotechnical purposes. It describes and provides guidance on the application of many of the sampling techniques included in this document albeit in a different context. Many contractors engaged to carry out work in connection with environmental studies will be familiar with its often prescriptive requirements. It includes detailed design information for some equipment. It is to be noted that the nomenclature used in this document may differ in places from that used in ISO 22475-1 because of the different contexts and traditions in the fields of geotechnical and geo-environmental investigation.

General principles to be applied in the design of sampling programmes for the purpose of characterization of soil and identification of sources and effects of contamination of soil and related material are given in ISO 18400-104[1)]. ISO 18400-104[1)] provides information about where to sample, the tests to be conducted, the type of sample, the depth of sampling and the required representativeness of the sampling system for sampling in respect of specific purposes.

This document is part of a series on sampling standards for soil. The role/position of the International Standards within the total investigation programme is shown in Figure 1.

1) Under preparation.

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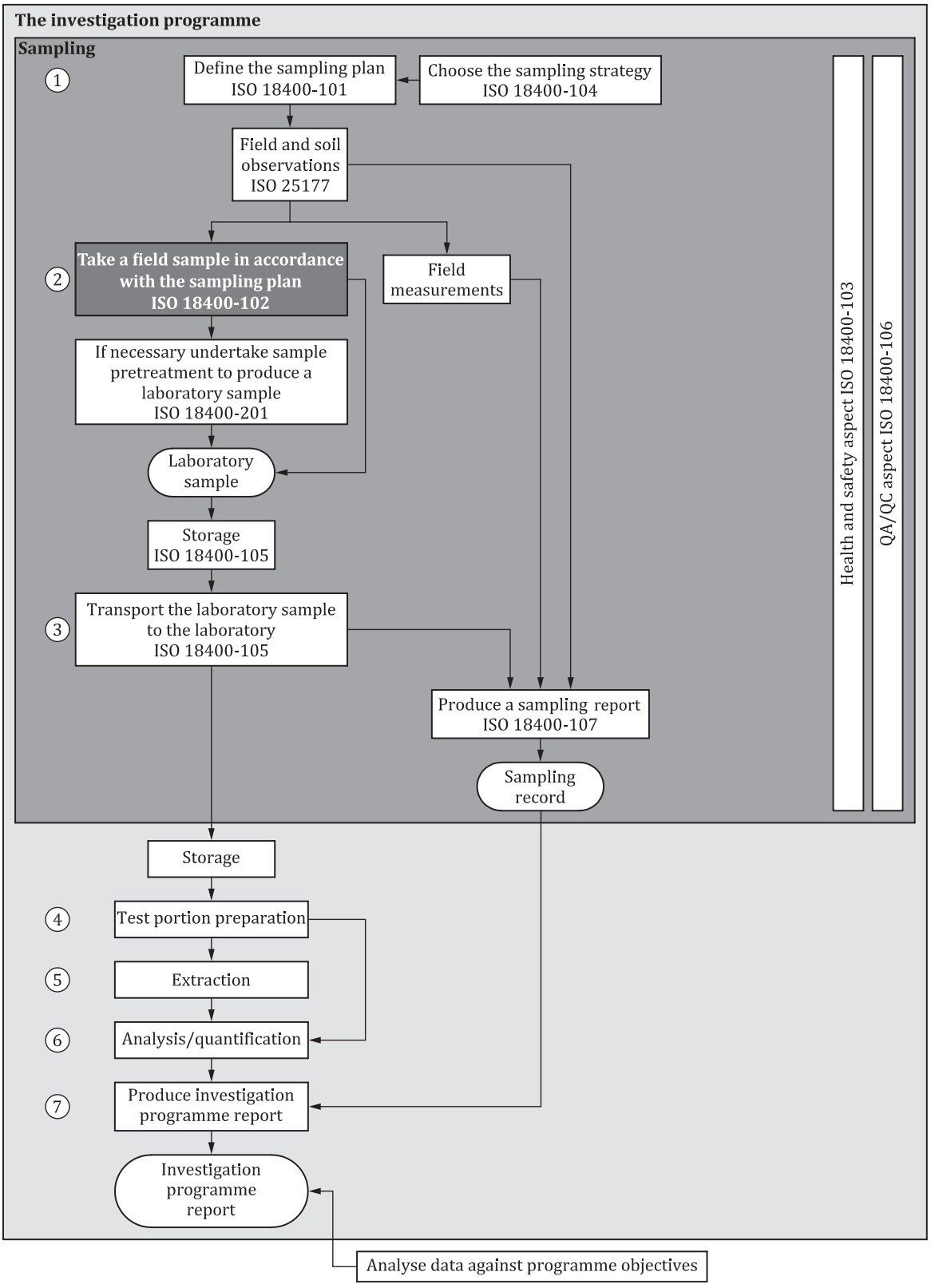


Figure 1 — Links between the essential elements of an investigation programme

NOTE 1 The numbers in circles in Figure 1 define the key elements (1 to 7) of the investigation programme.

NOTE 2 Figure 1 displays a generic process which can be amended when necessary.

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Soil quality — Sampling —

Part 102: Selection and application of sampling techniques

1 Scope

This document gives guidelines for techniques for taking samples so that these can subsequently be examined for the purpose of providing information on soil quality. It gives information on equipment that is typically applicable in particular sampling situations to enable correct sampling procedures to be carried out and representative samples to be collected. Guidance is given on the selection of the equipment and the techniques to use to enable both disturbed and undisturbed samples to be correctly taken at different depths.

This document does not cover:

— investigations for geotechnical purposes, though where redevelopment of a site is envisaged, the soil quality investigation and the geotechnical investigation may sometimes be beneficially combined;

— sampling of hard strata such as bedrock;

— methods for the collection of information on soil quality without taking samples such as geophysical methods;

— collection of water samples (these are to be collected in accordance with appropriate International Standards on ground or surface water sampling; for further information, see the ISO 5667 series);

— investigations of soil gas about which guidance is provided in ISO 18400-204;

— investigation of radioactively contaminated sites.

NOTE 1 "Sampling technique" is defined in ISO 11074.

NOTE 2 Guidance on the investigation and assessment of radioactivity in soils is provided in the ISO 18589 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3551-1, *Rotary core diamond drilling equipment — System A — Part 1: Metric units*

ISO 3552-1, *Rotary core diamond drilling equipment — System B — Part 1: Metric units*

ISO 10097-1, *Wireline diamond core drilling equipment — System A — Part 1: Metric units*

ISO 11074, *Soil quality — Vocabulary*

ISO 18400-101, *Soil quality — Sampling — Part 101: Framework for the preparation and application of a sampling plan*

ISO 18400-103, *Soil quality — Sampling — Part 103: Safety*

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ISO 18400-104[2)], *Soil quality — Sampling — Part 104: Strategies and statistical evaluations*

ISO 18400-105, *Soil quality — Sampling — Part 105: Packaging, transport, storage and preservation of samples*

ISO 18400-201, *Soil quality — Sampling — Part 201: Physical pretreatment in the field*

ISO 18400-202[3)], *Soil quality — Sampling — Part 202: Preliminary investigations*

ISO 25177, *Soil quality — Field soil description*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
cluster sample
composite sample for which the increments are taken over a small area around a predefined sampling point

Note 1 to entry: Sampled area is typically about 0,5 m^2 to 1,0 m^2.

Note 2 to entry: Material sampled is taken from within the same stratum or from material with the same characteristics.

3.2
cutting cylinder
cylindrical device with removable top and base forced into the surface of exposed soil to obtain an *undisturbed sample* (3.7)

3.3
disturbed sample
sample obtained from the ground without any attempt to preserve the soil structure

EXAMPLE Sample obtained by using a hand auger.

[SOURCE: ISO 11074:2015, 4.4.8, modified — changed to read: …from the ground…]

3.4
Kubiëna tin
metal box with removable top and base which can be forced into the surface of exposed soil to obtain an *undisturbed sample* (3.7)

Note 1 to entry: Usually made to desired size from aluminium, galvanized steel, or stainless steel sheet. Size varies, but a typical example might have an area of about 55 mm × 75 mm with a depth of 40 mm. The sample, once obtained, can be used to determine bulk density or may be impregnated with resin prior to the production of thin sections for microscopic examination.

2) Under preparation. Stage at the time of publication: ISO/DIS 18400-104:2016.

3) Under preparation. Stage at the time of publication: ISO/DIS 18400-202:2016.

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3.5
spatial sample
composite sample formed from evenly spaced increments of the same size taken over a predetermined area which are then bulked together

Note 1 to entry: The increments may be located according to a regular grid, random, or other pattern. In agricultural/horticultural land investigations, "N", "S", "W", and "X" sampling patterns are commonly used.

Note 2 to entry: The general premise is that the distribution of soil constituents is relatively homogeneous. Along the outline of such a pattern, a number of samples or increments are taken which are bulked and mixed to provide one (composite) sample for analysis.

3.6
spot sample
sample from a discrete location made up of one or more contiguous increments

Note 1 to entry: May be a *disturbed* (3.3) or *undisturbed sample* (3.7).

3.7
undisturbed sample
sample obtained from the ground with soil structure unaltered during sampling procedure

Note 1 to entry: Special sampling equipment is used so that the soil particles and voids cannot change from the distribution which exists in the ground before sampling (these can provide volume-proportional or mass-proportional results).

4 Principle

Sampling technique should be chosen taking into account all the needs of the investigation including planned distribution of sampling locations, the depth(s) from which samples are to be taken, the size and type of sample(s) required, the nature of any potential contaminants, and the nature of the site including any problems the site poses to carrying out the investigation.

The sampling technique(s) should be selected to enable:

— the collection of samples of soil and soil materials that can be presented to the laboratory for examination or analysis to establish basic information on the pedology and distribution of naturally occurring or man-made soils, their chemical, mineralogical and biological composition, and their physical properties at selected locations, as appropriate, to meet the objectives of the investigation;

— examination and recording of *in situ* materials exposed by the investigation.

NOTE 1 Detailed guidance on general aspects of sampling relevant to the selection and application of sampling techniques are given in 5.1 to 5.4 and about available techniques in 5.5. Detailed guidance on the selection of sampling techniques is provided in Clause 6 and on their application in Clause 7.

Among the decisions to be made is whether to use manual methods or machinery. Sampling may be required at or near the ground surface at some depth below the ground surface, or from locations deep below the ground surface. Methods of achieving the desired depth for sampling include formation of excavations (e.g. trial pits), by driven probes, or by drilling (e.g. boreholes).

Depending on the purpose for which sampling is being carried out, either disturbed or undisturbed, samples may be taken (5.3). Undisturbed samples could be required, for example, for soil physical testing or for determination of volatile organic compounds (VOCs).

NOTE 2 What constitutes a sufficiently undisturbed sample depends on the purpose for which the sample is required and can be a matter of judgement. For example, some compression of the sample might be acceptable when VOCs are to be determined, but would not be acceptable when the bulk density is to be determined. The ISO 22475 series defines classes of sample suitable for geotechnical testing.

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