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Soil quality — Sampling —

Part 105: Packaging, transport, storage and preservation of samples

Qualité du sol — Échantillonnage —

Partie 105: Emballage, transport, stockage et conservation des échantillons

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Foreword

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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).

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

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

Introduction

Samples of soils and related materials are liable to change as a result of physical processes and chemical or biological reactions occurring between the time of sampling and testing. This is especially true of soils contaminated with volatile constituents. The extent of these changes is a function of the chemical and biological characteristics of the sample, its temperature, its exposure to light, the nature of the container in which it is placed, the time between sampling and analysis, the conditions to which it is submitted, and seasonal conditions. The characteristics of a sample can change considerably in a few hours. For more information, see ISO 18512.

An important part of the sampling plan is to consider the possible extent of these changes and to prescribe the process of packaging, preservation, transport, and delivery in such a way that the samples are still representative when delivered to the laboratory.

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.

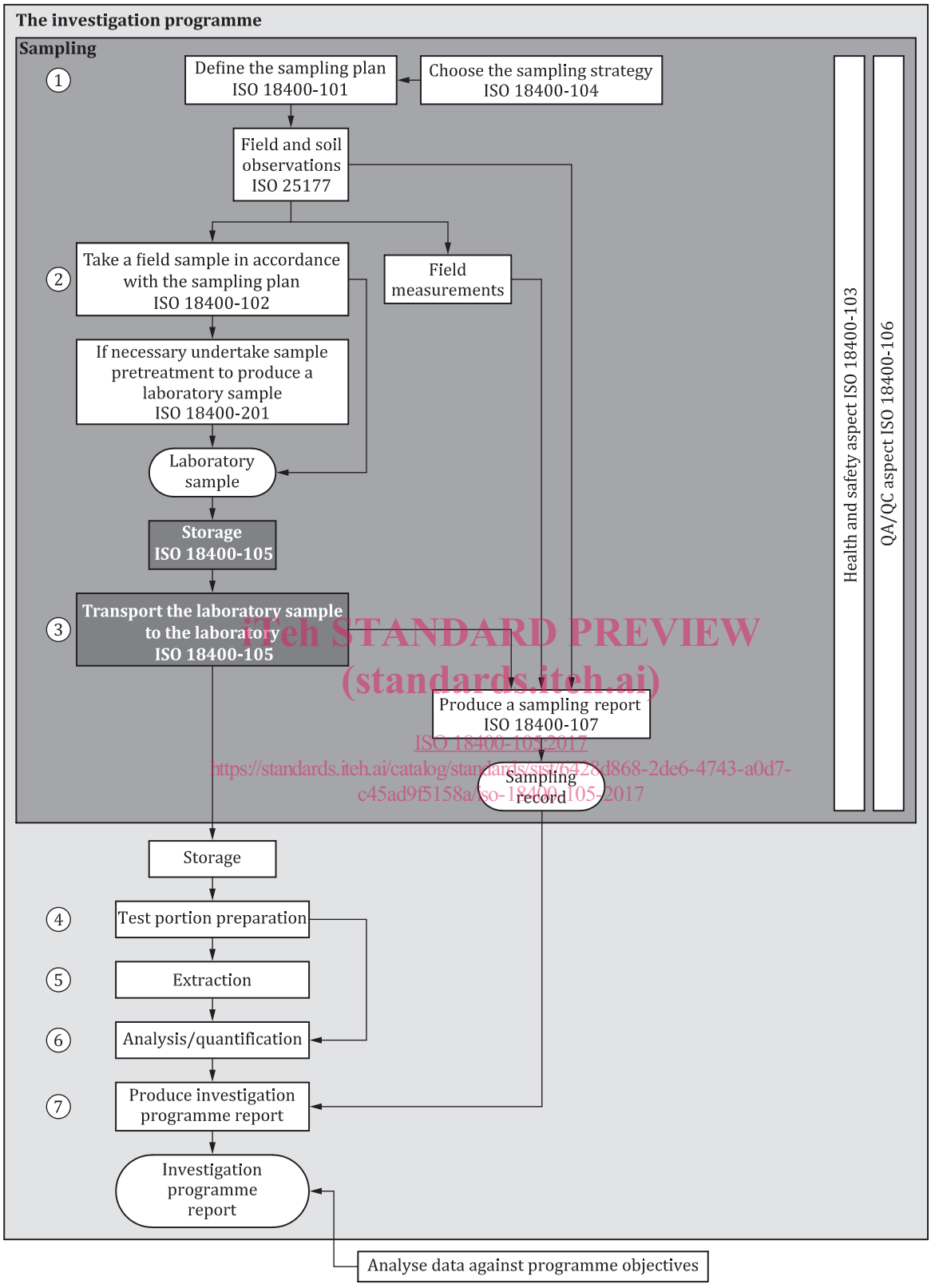

Figure 1 — Links between the essential elements of an investigation programme

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.

Soil quality — Sampling —

Part 105: Packaging, transport, storage and preservation of samples

1 Scope

This document establishes general principles for packing, preservation, transport and delivery of samples of soil and related materials with an emphasis on requirements for when chemical analysis of the samples is required, but with the intention that the general procedures are to be adapted as appropriate when other forms of testing are required (e.g. biological testing, physical tests on disturbed or undisturbed samples). Special procedures for specific sampling purposes are given in other parts of ISO 18400 (see also 7.2).

This document is intended to be read in conjunction with ISO 18512.

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 11074, *Soil quality — Vocabulary*

ISO 18512:2007, *Soil quality — Guidance on long and short term storage of soil samples*

ISO 22155, *Soil quality — Gas chromatographic determination of volatile aromatic and halogenated hydrocarbons and selected ethers — Static headspace method*

DIN 19747, *Investigation of solids — Pre-treatment, preparation and processing of samples for chemical, biological and physical investigations*

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
volatile organic compound
VOC
organic compound that is a gas under normal environmental/atmospheric conditions, although it can be found in the ground in the solid, liquid, and dissolved phase form, as well as in the gaseous phase

Note 1 to entry: The US Environmental Protection Agency uses a variety of definitions for VOCs in different contexts, but the one most appropriate here is “an organic compound which has a boiling point below that of water and which can easily vaporize or volatilize”.

Note 2 to entry: Examples include single-ring aromatic hydrocarbons and other low boiling halogenated hydrocarbons, which are used as solvents or fuels, and some degradation products.

4 Incorporation in the sampling plan

The project manager should prescribe containers and establish preservation techniques and storage times in consultation with the test laboratory and include this information in the sampling plan.

The laboratory performing the analysis or other tests should be consulted to ensure that appropriate containers and preservation and handling techniques are used and that any requirements specific to the proposed analytical method(s) or other method of test are taken into account (see 7.2 for transportation requirements for some special situations).

5 Preparing samples for consignment

5.1 General

All staff who handle samples, including any labelling and packaging, should be aware of their nature and possible hazards resulting from their handling (see ISO 18400-103). Samples should be transported to the laboratory and scheduled for analysis as quickly as possible to minimize any potential for physical, chemical, or biological changes before examination, usually within 24 h or in accordance with laboratory requirements for time-dependent analytes. See ISO 18512 for guidance on how laboratories should store and preserve samples for laboratory determinations including suitable storage periods under various conditions.

5.2 Containers

A container should be compatible with the nature of the soil sample and the constituents to be analysed. Any sample container used should not cause contamination of the sample, should not adsorb any sample components (for example, organic compounds), and should not allow losses of volatile components.

Containers should preferably be selected that can serve for long-term storage (procedures for storage are given in ISO 18512). Repacking will then not be necessary if longer term storage is required.

When the sample containers are supplied by the laboratory to which the samples are to be sent, a check should be made that they are sufficient size to hold the size of sample required as determined, following the guidance in ISO 18400-104[1)].

NOTE 1 Table 1 provides a summary of the advantages and disadvantages of containers in common usage. The containers usually used for routine work with "non-contaminated" soils are plastic (polyethylene or polypropylene) tubs with fitted lids, with a capacity of 1 kg to 2 kg of solid sample.

NOTE 2 The size of sample required, and hence the size of container required, will depend on a variety of factors including the nature of the soil (e.g. particle sizes) and the purpose for which the sample is required (e.g. the range of tests to be carried out). Guidance on minimum samples sizes is provided in ISO 18400-104[1)].

NOTE 3 When soils that might be contaminated are to be analysed or otherwise tested, it might be necessary to take more than one sample from a sampling location in order that sample integrity is properly preserved prior to analysis and to permit a full range of potential contaminants to be determined.

Plastic bags shall not be used when analysis for organic compounds is to be carried out.

Sample containers should be clean and dry. The choice of cleaning method will depend on container material and the constituents to be analysed and should not contaminate the container with regard to the constituents to be analysed or cause harm to the environment or human health.

Where organic compounds are to be determined, inert containers, which prevent loss by adsorption or volatilization, should be used. Where no Volatile Organic Compounds (VOCs) are present, a wide-mouthed amber glass jar may be used, but if VOCs are present, sampling and handling should be done in accordance with ISO 22155 or DIN 19747.

1) Under preparation.

Uncertainty about whether a compound should be regarded as volatile or not should trigger a specific quality scheme to ensure that packaging, storing, etc. does not introduce bias, cross contamination, or other forms of unacceptable errors.

Different sizes and types of container should always be available on site, so that if unexpected materials are encountered, they can be properly sampled.

Samples for biological testing should be placed in a loosely tied polythene bag or similar to preserve sample integrity while giving free access to air (see also 7.2).

Table 1 — Suitability of containers for analytical samples

Container material	Substances present in the sample[f]					Analytical requirements				Advantages	Disadvantages
	Acid	Alkaline	Inorganics	Oils and tars	Solvents and other organic compounds including VOCs	Inorganics	Oils and tars	Non-volatile and semi-volatile organic compounds	Volatile organic compounds		
Plastic bag	++[a]	++[a]	++	-	-	+[a]	-	-	-	Low costs	Easily damaged
Plastic bucket or tub	++	++	++	-	-	++[b]	-	-	-	Low costs	Removing excess air is not possible
Wide-mouthed glass bottles[c,d] (screw-capped)	++	-	++	++	++[c,d,e]	++	++	+	+-[c,d,e]	Inert	Fragile
Aluminium cans (screw-capped)	-	-	+	++	++	++	++	+	+	-	Costs Aluminium contamination affected by acids/alkali
Fluorinated polymer containers, e.g. PTFE	++	++	++	++	++	++	++	++	++	Inert	High cost

++ Very suitable.

+ Might be suitable.

- Unsuitable.

a Should not be used for contaminated land investigation samples.

b Should not be used for contaminated land investigation samples if analysis for organic contamination might be required.

c For optimum performance when volatile organic compounds are present might require use of undisturbed sample with solvent such as methanol.

d Use of PTFE septum could be appropriate.

e A small jar of about 60 ml capacity is commonly used as it is then easier to ensure close packing of fine soils when this is considered necessary.

f The substance is present but there is not necessarily a requirement to analyse for it. However, use of an inappropriate container might compromise the results of those analyses that are to be carried out.