
Soil quality — Field soil description

Qualité du sol — Description du sol sur le terrain

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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 voluntary nature of standards, 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. (standards.iteh.ai)

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

This second edition cancels and replaces the first edition (ISO 25177:2008), which has been technically revised.

The main changes compared to the previous edition is as follows.

- The 2015 edition of the World Reference Base for soil resources^[24] has been adapted.
- References to geotechnical standards ISO 14688-1^[3] and ISO 14688-2^[4] have been made.
- A new [Clause 4](#) describing how to use this document has been added and subsequent clauses have been renumbered.
- A new [Clause 5](#) describing objectives and methods has been added and subsequent clauses have been renumbered. The aspects to describe and how to do this is more separate from the observations and background information.
- The numbering and encoding have been made more consequent and logical.
- New aspects about coarse anthropogenic elements, oil-water reaction pan and signs of pollution or contamination have been added.
- A new [Clause 11](#) about reporting has been added.
- A new [Annex A](#) about landforms has been added and subsequent annexes have been renumbered.
- The former Annex B listing reference soil groups of the WRB^[24] has been removed.
- A new [Annex G](#) about common coarse elements found in soil and soil surface has been added.
- A new [Annex H](#) about recording soil description observations for specific types of soil quality investigations has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Traditionally, description of soils and their environment was carried out as parts of soil surveys and soil inventories, the purpose being to describe the pedogenic context of the soil and assess applied aspects, principally agronomic potentials.

Today, many soil observations are made as part of either much broader, or alternatively more focused, environmental studies, and might include analysis for objectives such as:

- identifying human influences on soils, with, particular attention being paid to the negative effects of these influences (for example contamination with possible hazardous substances, or deterioration of physical soil properties);
- land protection within the context of sustainable agriculture and forestry;
- assessing the fate of contaminants introduced to the soil;
- assessing the consequences arising from changes in the use of the soil;
- setting up monitoring programs for specific purposes (such as observation of changes of soil properties over time);
- developing spatial databases (used in the context of GIS) aimed at facilitating the geographical representation of soils;
- and for many other purposes.

While the general framework of this document has stayed the same in this updated version, additions include references to the ISO 18400 series (see [Figure 1](#)), observations for soil contamination, and description of artificial material and soil layers.

The description of soils and sites is often accompanied by field and laboratory measurements, and therefore field measurement observations are included in this document.

The original text was based on aspects of the traditional approach to soil description {for example the “Guidelines for soil description” from the FAO (Rome 2006)^[30] and the soil type classification from the World Reference Base for soil resources (WRB)^[24]}.

Soil descriptions and associated soil data are used and re-used for a variety of purposes. For wider utilization of data from soil descriptions, this document can be used in conjunction with other (commonly and publicly available) standards. Some types of soil information, specifically soil contamination data and data on anthropogenic and exogenous material, were not available in earlier versions and have been included here.

Depending on the objective/s of an investigation, specific observations of interest will be made and recorded. Even within a particular field of interest, the degree of detail in the soil description in the field will vary, depending on the scope of the project.

The quality of field soil descriptions is strongly dependent on the knowledge and especially the experience of the person making and/or recording the observations in the field, since most field observations are estimations (sometimes with the help of reference materials and devices like colour-charts, magnifiers, sieves, or scatter diagrams).

Soil quality — Field soil description

1 Scope

This document provides guidance on the description of soil in the field and its environmental context. It is applicable to natural, near-natural, urban and industrial sites. The soil observations and measurements can be made on a project site level, on a plot level, on layer or horizon level and on specific soil constituents.

It also provides guidance on how to describe layers of anthropogenic (artificial) material or layers that were not modified by pedogenic processes in the strict sense and how to describe coarse material of natural or artificial origin.

This document can be used in combination with other publications that provide guidance or requirements regarding specific aspects of soil observations and measurements.

NOTE 1 It might not be possible or necessary to record data under all the headings listed in [Clauses 4 to 11](#).

NOTE 2 Overall guidance for presentation of information from soil surveys is given in ISO 15903.

NOTE 3 The guidance provided assumes that sampling will be done in accordance with ISO 18400.

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2 Normative references (standards.iteh.ai)

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 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

ISO 3166-2, *Codes for the representation of names of countries and their subdivisions — Part 2: Country subdivision code*

ISO 11074, *Soil quality — Vocabulary*

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:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at: <http://www.electropedia.org>

3.1

observation

act of observing a property, with the goal of producing an estimate of the value of the property

Note 1 to entry: Adapted from ISO 19156.

4 How to use this document

4.1 General

This document describes the most commonly used field observations in soil quality investigations. The observations are recorded at different levels:

- general/site (see [Clause 6](#));
- profile/surface point (see [Clause 7](#) and [8](#));
- horizon/layer (see [Clause 9](#) and [10](#)).

Pre-defined observations (picklists) are tabulated with their corresponding codes. Where relevant, explanatory text is given before or after the observation to be recorded [e.g. in this subclause ([4.1](#))]. Some observations to be recorded are so commonly understood that they are simply listed, for example in [6.5](#).

Where possible values associated with observations are pre-defined (picklists) and these values are defined with percentages (%), it is also permissible to record estimated specific percentage values.

EXAMPLE Recording of a mottle abundance value of 10 % is allowed (see [9.8.2](#)). This can also be recorded as code “3” or as “common”.

This means that a more precise estimate can be recorded (e.g. rather than a range), however it does not mean that the estimates are in fact more accurate, since accuracy may depend on both the requirements of the project and skill of the observer.

For soil descriptions in the field and for digital data exchange, only the codes and values can be recorded. In the full field report, the text of the description can also be provided. The full text descriptions belonging to codes shall be available.

NOTE In the digital exchange of data this might be in the form of a hint or link to the table.

The context of the information is important for the application of the results. In [Figure 1](#), the process for soil description is provided.

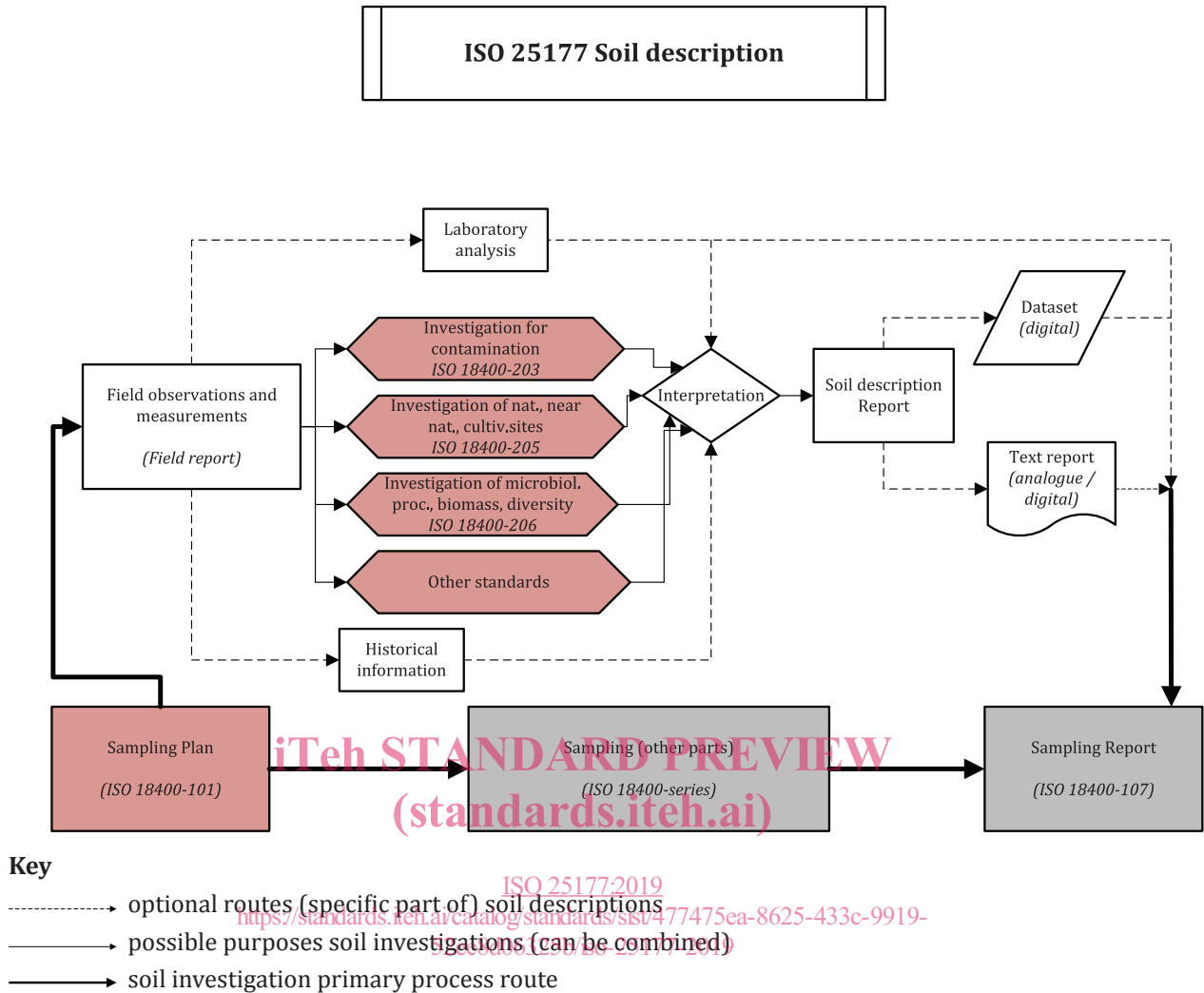


Figure 1 — Soil description process

4.2 Combined use with other description standards

This document can be used separately or in combination with standards that provide further guidance or requirements for specific aspects of soil observations and measurements.

Where relevant, this document can be applied with the following references:

- FAO Guidelines for soil descriptions (Rome)^[30], for example when describing soils and denoting horizons;
- World Reference Base for soil resources (WRB)^[24], for example when determining soil types;
- ISO 14688-1 and ISO 14688-2.

If additional codes, descriptions or requirements from these or other complementary references is used, these shall be recorded (see 6.1).

EXAMPLES

- ISO 25177:2019 FAO
- ISO 25177:2019 ISO 18400-203

4.3 Mandatory or optional observations

Where observations are mandatory, it is explicitly indicated by underlined text in this document. If not mandatory the observations to record are optional.

For a number of common soil investigation types the mandatory observations are listed in [Annex H](#). If optional observations are described, they shall be recorded according to this document.

NOTE National legislation or project rules can demand that optional observations can be mandatory in some contexts.

4.4 Accuracy and units

Because of the very different objectives for most field observations, no minimum accuracy is stipulated. For some observations, the unit to be used is mandatory. The unit specified is generally the most commonly used one and fit for the purpose for most soil descriptions.

EXAMPLE x- and y- coordinate in metres.

Depending on the accuracy required for an investigation, recording the coordinates in whole metres may be sufficient, however, more accuracy is needed at times (for example, plus or minus 0,01 metres). The unit used in the second case is still metres, although the accuracy may be significantly better than a whole metre.

NOTE The units and number of digits output from a given device do not automatically reflect its accuracy. For example, a GPS measurement with 3 digits after comma or point (depending on the convention used) does not mean that the value is accurate to 1 mm.

4.5 Encoding

Field observations can comprise different types of results. For some observations, the result should be one of the results given in the pre-defined picklists. For other observations, results should be recorded as estimated or measured values. At least at all main levels (site-, profile-, layer/horizon-) there should be capacity for free text for observations that do not match those in the pre-defined picklists.

Numeric codes in this document are defined with the same number of digits. If there are more than 9 and less than 99, a zero is added to the codes 1 until 9 (i.e. 01, 02, 03, etc.). Numeric codes start in principle with 1, unless the first value class is zero or near-zero. In that case, the numeric codes start with zero (0).

EXAMPLE In [8.4](#), Code 0 = no visible erosion.

If not observed, but a code is needed for an observation, an "X" can be used.

NOTE X does not mean observed with result 0 (zero).

In this document, some descriptions and associated codes are derived from FAO^[30] and/or ISO 14688-1. In addition, new observation results have been added, codes from the earlier version of this document might have been changed, and new codes might have been added.

5 Description objectives and methods

5.1 General

The reference for this clause is the FAO Guidelines for soil descriptions^[30]. If another complementary reference is used, this shall be clearly stated in the text of the written report, or in the meta-data of the digital data that is reported.

5.2 Investigation objectives

Soil investigations usually have specific objectives. Other standards adapted to various scopes can be combined with this document.

Main investigation types based on project objectives or approaches include:

- investigation for contamination (e.g. according to ISO 18400-203);
- investigation for nature or near-nature management (e.g. according to ISO 18400-205);
- investigation for cultivation management (e.g. according to ISO 18400-205);
- investigation for agricultural management (e.g. according to ISO 18400-205);
- investigation for forestry (e.g. according to ISO 18400-205);
- investigation for archaeology;
- investigation of soil gas (e.g. according to ISO 18400-204);
- biological investigation (e.g. according to ISO 18400-206).

NOTE 1 See [Figure 1](#) for a schema of how this document can be used in combination with other standards.

NOTE 2 [Annex H](#) provides a list of the most commonly used observations of soil that can be recorded and the importance of separate types of soil investigations.

5.3 Quality assurance and quality control

The desired accuracy and level of detail is dependent on the project scope and project objectives.

Where aspects of soil description are mentioned or given, ISO 18400-106 can be applied.

Alternatively, or in addition, other guidance on QA/QC can be applicable.

For digital exchange of soil related data ISO 28258 can be applied.

Field estimations depend on the knowledge and experience of the observer. To ensure consistent soil observations, it is recommended to regularly undertake field soil descriptions with experienced personnel.

NOTE 1 Education and training of staff is important. Projects can benefit with staff that has experience with similar soil sites, soil layers and scopes.

NOTE 2 Assessing inexperienced personnel's estimates of texture for example can be done by comparing their results with reference analysis and reference samples, and/or having them working with personnel experienced in field soil description.

NOTE 3 A check for logical and internal consistency of field data can give a first impression of data quality.

5.4 Description structure

Soil is described at different levels.

- General level: references of a soil description, e.g. profile numbers, geographical coordinates. See [Clause 5](#).
- Site level: observations of the location or site. The scale of the location or site is determined in the project. A project can have different sites or locations. A site or location usually has more than one plots. See [Clause 6](#).

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- Plot level: observations that can be made on profile level: from the borehole or in a trial pit or trench. See [Clause 7](#) and [8](#).
- Layer/horizon level: observations that can be made on one spot from the surface down to the parent material. See [Clause 9](#).

NOTE The difference between plot and site (location) is explained in ISO 28258.

6 Description of general references and general information

6.1 General

Record the general reference, using the following codes or descriptions:

Code	Description
1	ISO 25177
2	ISO 25177 and FAO ^[30]
3	ISO 25177 and ISO 14688-1
4	ISO 25177 and FAO ^[30] and ISO 14688-1
5	ISO 25177 and other standard(s) – see 4.2

Record, if relevant, (other) reference standard(s) and general information.

6.2 Site/profile numbers

Record the profile number(s) or code(s).

Record the survey number or code.

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6.3 Location

Record the country.

Codes according to ISO 3166-1 and ISO 3166-2 shall be used. For historical research, designations according to ISO 3166-3 should be considered, when necessary.

Record the administrative division.

To be adapted according to the country, provinces, states, regions, departments, towns. This can be recorded uncoded and coded. If coded, the definition shall be available, for example, in code lists.

Record the toponym and address of the location.

Place name, street and street number, postal code, local/extra place name.

6.4 Geographical coordinates

Latitude and longitude of the site should be given as accurately as possible in decimal degrees (WGS84). Other reference systems may be used if specified.

Record the type of geographical reference system (degrees, lambert, national reference grid).

Record the position within the geographical reference system (longitude in degree/min/s, latitude in degree/min/s).

Record the altitude (in metres).

6.5 Date and time of observations

Record the year, month and day of the observations.

Record, if relevant, the time of the observations.

6.6 Author and organization

Record the author's name.

Record the accreditation (e.g. reference to the qualification of person and/or organization).

Record the name of organization.

Record, if relevant, the department.

Record the address.

Record the telephone number.

Record the e-mail address.

7 Profile environment

7.1 General

The environmental setting of the profile that is to be described may be recorded using a combination of different standards if necessary (see 4.2).

The reference for this clause is the FAO^[30]. If another reference is used, this shall be clearly stated in the text of the written report or in the meta-data of the digital data that is reported.

7.2 Previous precipitation

Record, using the following codes or descriptions.

Code	Description
0	No precipitation within the last month
1	No precipitation within the last week
2	No precipitation within the last three days
3	Rainy but no intense precipitation within the last three days
4	Moderate rain for several days or intense rainfall the day before the observation
5	Extreme precipitation or snow melt or inundation just before the observation
X	Not observed

7.3 Land use at plot level (checked by detailed field survey)

Record, using the following codes or descriptions.

Code	Description
01	Buildings and industrial infrastructures
02	Mining site (current or past)
03	Metal processing sites
04	Chemical processing sites
05	Oil and gas production sites