INTERNATIONAL STANDARD

ISO 14688-1

First edition
2002-08-15

Geotechnical investigation and testing — Identification and classification of soil —

Part 1: Identification and description

Recherches et essais géotechniques — Identification et classification des sols —

Partie 1: Identification et description

Reference number
ISO 14688-1:2002(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

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 3.

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 part of ISO 14688 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14688-1 was prepared by Technical Committee ISO/TC 182, *Geotechnics*, Subcommittee SC 1, *Geotechnical investigation and testing*.

ISO 14688 consists of the following parts, under the general title *Geotechnical investigation and testing — Identification and classification of soil*:

— *Part 1: Identification and description*

— *Part 2: Classification principles and quantification of descriptive characteristics*

Geotechnical investigation and testing — Identification and classification of soil —

Part 1:
Identification and description

1 Scope

This part of ISO 14688, together with ISO 14688-2, establishes the basic principles for the identification and classification of soils on the basis of those material and mass characteristics most commonly used for soils for engineering purposes. The relevant characteristics may vary and therefore, for particular projects or materials, more detailed subdivisions of the descriptive and classification terms may be appropriate.

The general identification and description of soils is based on a flexible system for immediate (field) use by experienced persons, covering both material and mass characteristics by visual and manual techniques.

Details are given of the individual characteristics for identifying soils and the descriptive terms in regular use, including those related to the results of tests from the field.

This part of ISO 14688 is applicable to natural soils *in situ*, similar man-made materials *in situ* and soils redeposited by man. The identification and description of rocks is covered by ISO 14689.

The identification and classification of soil for pedological purposes, as well as in the framework of measurements for soil protection and for remediation of contaminated areas, is covered by ISO 11259.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 14688. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 14688 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 11259, *Soil quality — Simplified soil description*

ISO 14688-2, *Geotechnical investigation and testing — Identification and classification of soil — Part 2: Classification principles and quantification of descriptive characteristics*

ISO 14689, *Geotechnical investigation and testing — Identification and description of rock*

3 Terms and definitions

For the purposes of this part of ISO 14688, the following terms and definitions apply.

3.1
soil
assemblage of mineral particles and/or organic matter in the form of a deposit but sometimes of organic origin, which can be separated by gentle mechanical means and which includes variable amounts of water and air (and sometimes other gases)

NOTE 1 The term is also applied to made ground consisting of replaced natural soil or man-made materials exhibiting similar behaviour, e. g. crushed rock, blast-furnace slag, fly-ash.

NOTE 2 Soils may have rock structures and textures may exist but soils are usually of lower strength than rocks.

3.2
identification of soil
naming and description of a soil on the basis of its grading, type of material and characteristics of mineral and/or organic constituents and plasticity

3.3
geological structure
variation in composition including bedding and discontinuities

3.4
discontinuities
bedding planes, joints, fissures, faults and shear planes

3.5
organic matter
matter consisting of plant and/or animal organic materials, and the conversion products of those materials, e.g. humus

NOTE Organic matter usually has a very high water content.

3.6
grading
measure of the particle sizes of a soil and their distribution

3.7
fraction
part of a soil that can be distinguished on the basis of defined particle sizes

3.8
plasticity
property of a cohesive soil to change its mechanical behaviour with change of water content

3.9
volcanic soils
pyroclastic materials produced and formed by explosive volcanic eruption; e.g. pumice, scoria, volcanic ash

4 Identification of soil

4.1 General

Subclauses 4.2 to 4.10 give soil characteristics that generally permit soil to be identified with adequate accuracy for general (or preliminary) characterization. A more accurate identification and classification based on grading, plasticity or organic content can be achieved by laboratory tests. In addition to identifying soils, the condition in which a soil is encountered, any particular secondary constituents, other features of a soil, such as carbonate content, particle shape, surface roughness of particles, odour, any common names and the geological classification should all be indicated. For the identification and description, methods and additional tests shall be carried out according to clause 5. The identification and description of soils generally follows the flow chart in Figure 1.

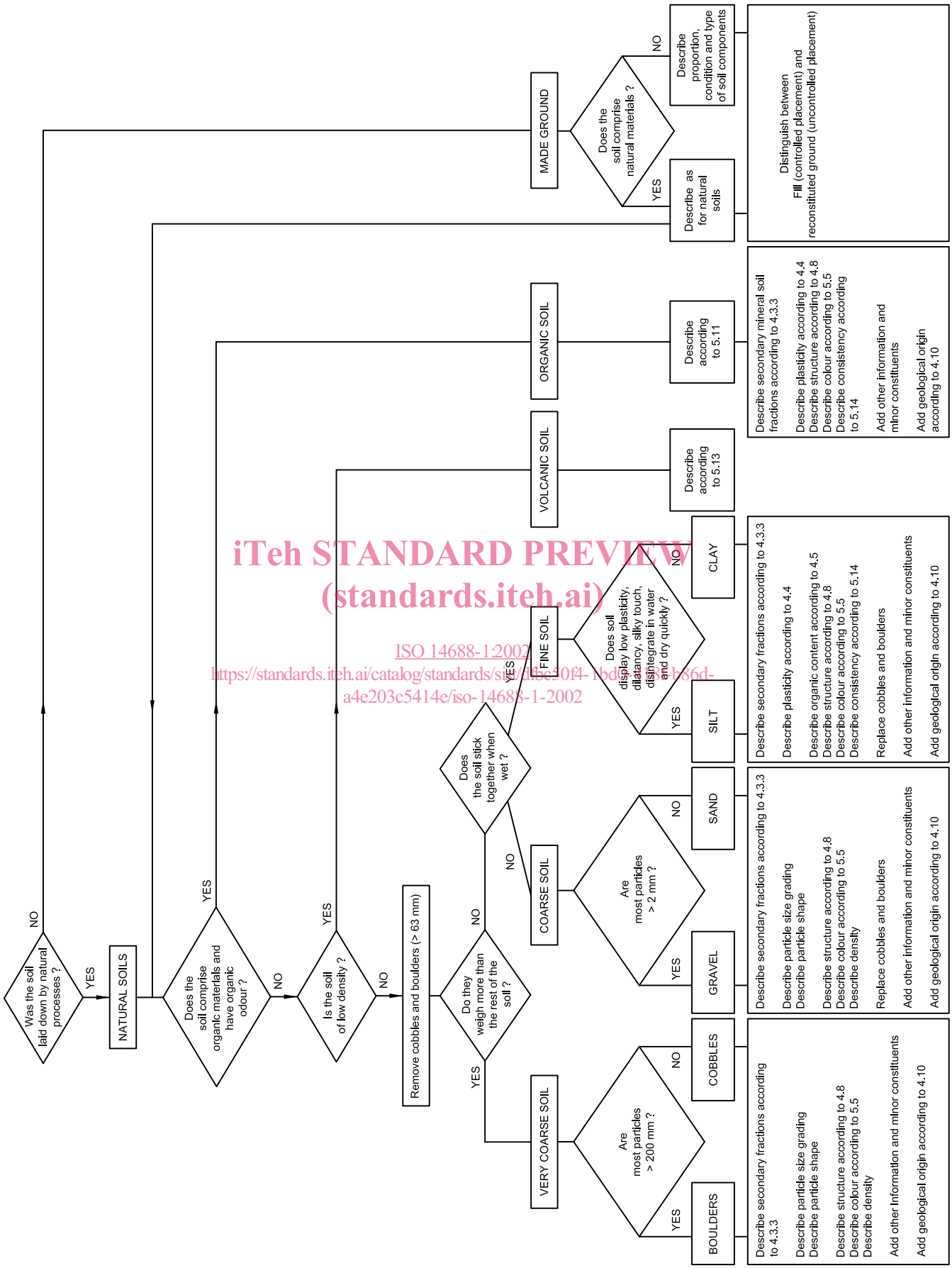

Figure 1 — Flow chart for the identification and description of soils

4.2 Particle size

Particle size is the fundamental basis for designating mineral soils using particle fractions to distinguish the soil mechanical behaviour. Table 1 shows the terms to be used for each soil fraction and its sub-fractions, together with the corresponding chosen range of particle sizes.

Basic soils are soils with uniform grading (i.e. they consist of particles of only one size range) as specified in Table 1 (e.g. gravel Gr, fine sand FSa, coarse silt CSi). The first letter of the abbreviation of the soil fraction is a capital.

Table 1 — Particle size fractions

Soil fractions	Sub-fractions	Symbols	Particle sizes mm
Very coarse soil	Large boulder	LBo	> 630
	Boulder	Bo	> 200 to 630
	Cobble	Co	> 63 to 200
Coarse soil	Gravel	Gr	> 2,0 to 63
	Coarse gravel	CGr	> 20 to 63
	Medium gravel	MGr	> 6,3 to 20
	Fine gravel	FGr	> 2,0 to 6,3
	Sand	Sa	> 0,063 to 2,0
	Coarse sand	CSa	> 0,63 to 2,0
	Medium sand	MSa	> 0,2 to 0,63
	Fine sand	FSa	> 0,063 to 0,2
Fine soil	Silt	Si	> 0,002 to 0,063
	Coarse silt	CSi	> 0,02 to 0,063
	Medium silt	MSi	> 0,006 3 to 0,02
	Fine silt	FSi	> 0,002 to 0,006 3
	Clay	Cl	⩽ 0,002

4.3 Composite soils

4.3.1 General

Most soils are composite and consist of principal and secondary fractions. They are designated by a noun (main term) describing the principal fraction and by one or more adjectives (qualifying terms) describing the secondary fractions (e.g. sandy gravel saGr, gravelly clay grCl).

Composite soil terms shall be written with small letters.

Interlayered soils can be written in small underlined letters following the principal soil fraction (e.g. gravelly clay interbedded with sand grClsa).

4.3.2 Principal fraction

The principal fraction in terms of mass determines the engineering properties of the soil. It may be given in capital letters for clarity.

In the case of very coarse soils, the principal fraction is the relevant very coarse soil fraction predominating in terms of mass. The very coarse fraction should be separated from the sample before identifying the fine and coarse fractions.

In the case of coarse soils, the principal fraction is the relevant coarse soil fraction predominating in terms of mass. Composite coarse soils include a fines fraction (silt and/or clay) that does not determine the engineering properties of the soil.

NOTE 1 The fines fraction is not regarded as determining the characteristics of a composite soil if the soil exhibits no, or only very low, dry strength in the test described in 5.6 or if, when tested in accordance with 5.8, it exhibits a very low plasticity.

In both cases, the name shall be based on the subfraction into which coarse soil is identified, cf. 4.2 e.g. gravel, sand, medium gravel, fine sand.

In the case of fine soils, the principal fraction is the relevant fine soil type determining the engineering properties of the soil.

In the case of composite fine soils, the fines fraction determines the engineering properties of the soil.

NOTE 2 The fines fraction is regarded as determining the characteristics of a composite soil if this is of at least medium dry strength as determined in the test described in 5.6, or exhibits a certain degree of plasticity as determined in the test described in 5.8.

In both cases, the soil shall be termed either “clay” or “silt”, depending on the plasticity of the fines fraction and not on the grading. The identification shall be based on 5.6, 5.7, 5.8 and 5.9.

NOTE 3 The minimum size of soil sample required for accurate identification increases with maximum particle size.

4.3.3 Secondary fractions

Secondary and further fractions do not determine but will affect the engineering properties of the soil.

The secondary fractions as adjectives shall be placed with the term describing the principal fraction in the order of their relevance, as shown in the following examples:

— sandy gravel (saGr),
— coarse sandy fine gravel (csaFGr),
— medium sandy silt (msaSi),
— fine gravely coarse sand (fgrCSa),
— silty fine sand (siFSa),
— fine gravelly, coarse sandy silt (fgrcsaSi),
— medium sandy clay (msaCl).

If coarse secondary fractions are present in a particularly small or particularly large proportion, the term “slightly” or “very” shall precede the qualifying term.

If it is a fine soil, the properties of which are determined by fines fractions, a soil can be identified as “silt” or “clay” by checking for the presence of fine secondary constituents on the basis of its plasticity properties using the tests described in 5.6, 5.7, 5.8 and 5.9.

If, in the case of coarse soils, two soil fractions are present in approximately equal proportions, an oblique shall be placed between the relevant terms, e.g. gravel/sand (Gr/Sa)or fine/medium sand (FSa/MSa).

4.4 Plasticity

Soils that are subjected to the test described in 5.8 and permit their consistency limits to be determined, may be identified as exhibiting plastic properties.

NOTE Such soils are also referred to as cohesive soils.