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Geotechnical investigation and testing — Identification and classification of soil —

Part 1: Identification and description

Reconnaissance et essais géotechniques — Identification et classification des sols —
Partie 1: Identification et description

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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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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.

This document was prepared by Technical Committee ISO/TC 182, *Geotechnics*.

This second edition cancels and replaces the first edition (ISO 14688-1:2002), which has been technically revised. It also incorporates the Amendment ISO 14688-1:2002/Amd 1:2013.

A list of all parts in the ISO 14688 series can be found on the ISO website.

Introduction

This document gives details of the procedures to be followed in the identification and description of soils. Clauses 4 and 5 provide the rules for soil identification which are used at all stages of ground investigation and geotechnical design. Clauses 6 and 7 give details of the procedures to be followed by those actually describing soils in the field or laboratory. This comprises the description of the soil material in all aspects and the description of the soil mass characteristics in terms of the bedding and discontinuities.

The level of detail in a description will depend on the characteristics of the soil, the size and quality of the soil exposure or sample, and the needs of the particular project. The person carrying out the field identification and description should be suitably qualified, skilled and experienced to make a correct and appropriate description and experienced in the geological materials involved in the investigation.

Practice in soil identification and description varies from country to country, in part reflecting significant differences in geological conditions. In addition, the quality of samples available for description vary due to the investigation methods employed, as methods of investigation have been developed in response to the ground conditions present.

Following identification and description, ISO 14688-2 gives the means by which soils can be classified into groups of similar composition and geotechnical properties based on the results of field and laboratory tests with respect to their suitability for geotechnical engineering purposes. Test results provide a means of checking the accuracy of the field or laboratory descriptions.

Geotechnical investigation and testing — Identification and classification of soil —

Part 1: Identification and description

1 Scope

This document specifies the rules for the identification and description of soils and is intended to be read in conjunction with ISO 14688-2, which outlines the basis of classification of those material characteristics most commonly used for soils for engineering purposes. The relevant characteristics could vary and therefore, for particular projects or materials, more detailed subdivisions of the descriptive and classification terms could be appropriate.

This document specifies procedures for the identification and description of soils based on a flexible system for 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 hand tests carried out in the field as part of the descriptive process.

This document is applicable to the description of soils for engineering purposes which can be those laid by natural processes, those laid by man or comprise synthetic materials.

NOTE 1 The identification and description of rocks are covered by ISO 14689-1. Identification and description of materials intermediate between soil and rocks are carried out using the procedures in this document, ISO 14688-2 and ISO 14689-1 as appropriate.

NOTE 2 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 25177.

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 14688-2, *Geotechnical investigation and testing — Identification and classification of soil — Part 2: Principles for a classification*

ISO 14689-1, *Geotechnical investigation and testing — Identification and classification of rock — Part 1: Identification and description*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14688-2 and the following apply.

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

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

— IEC Electropedia: available at www.electropedia.org

3.1
anthropogenic soil
soil (3.17) placed by human activity which can be divided into those composed of reworked natural soils and those composed of synthetic materials

3.2
carbonate soil
soil (3.17) with a significant proportion of calcium carbonate

3.3
description of soil
description of the type of material, the characteristics of the mineral (inorganic) and/or organic constituents and any fabric, bedding or discontinuities

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

3.5
fill
anthropogenic soil or rock materials placed with engineering control

3.6
geological structure
variation in composition including bedding and *discontinuities* (3.4)

3.7
grading
measure of the particle sizes of a *soil* (3.17) and their distribution

Note 1 to entry: See 3.13.

3.8
identification of soil
naming of a *soil* (3.17) on the basis of its mineral composition, *grading* (3.7) and/or *plasticity* (3.16) and/or organic content

Note 1 to entry: The identification may include geological information, such as depositional environment, geological age and geological formation.

3.9
loess
windblown (aeolian) sediment

3.10
made ground
reconstituted ground
anthropogenic soil (3.1) or rock materials placed without engineering control

3.11
mineral soil
soil (3.17) composed largely or entirely of mineral (inorganic) constituents

3.12
organic soil
soil (3.17) containing a high proportion of plant and/or animal organic materials and the conversion products of those materials

Note 1 to entry: Organic soil has a very low density and usually a very high water content.

3.13
particle size distribution
measure of the particle sizes of a *soil* (3.17) and their distribution

Note 1 to entry: See 3.7.

3.14
particle size fraction
size fraction
portion of a *soil* (3.17) defined by a range of particle sizes

3.15
plastic behaviour
propensity of fine *soil* (3.17) to undergo permanent deformation when kneaded by hand

Note 1 to entry: This behaviour, often referred to as the plasticity, depends on water content, mineral composition and particle size fractions.

Note 2 to entry: Plasticity can be measured by the Atterberg limits in the laboratory (see ISO 14688-2).

3.16
plasticity
propensity to undergo permanent deformation when kneaded by hand

3.17
soil
aggregate of minerals and/or organic materials which can be disaggregated by hand in water

Note 1 to entry: The term is also applied to anthropogenic soil consisting of materials exhibiting similar behaviour but reworked or artificially made, e.g. embankment fill, crushed rock, mine tailings.

Note 2 to entry: Soils may result from the weathering of rocks and have rock structures and/or textures, but are of lower strength than rocks.

3.18
sulfide soil
soil (3.17) with a high iron sulfide content

3.19
till
original form of a glacigenic multi-graded material derived from ice sheets and glaciers

3.20
volcanic soil
unconsolidated pyroclastic sediment produced and formed by explosive volcanic eruption

4 General

Soils shall be identified and described in accordance with this document. The classification of soils and the description of rocks shall be carried out in accordance with ISO 14688-2 and ISO 14689-1, respectively.

Soils are categorized as natural soils or anthropogenic soils. Natural soils are either mineral soils (including carbonate soils, volcanic soils, loess and till) or organic soils.

The characteristics of soils are identified in accordance with the rules given in Annex A which are based on the particle size grading of very coarse and coarse particles, the plasticity of fine particles, the content of organic matter (for organic soils) and the content of carbonate (for carbonate soils) all of which play a major role in determining the engineering properties of the soil and form the basis of the soil's identification. The soils shall be identified in the field following the guidance given in Clause 5.

This comprises decisions as to the primary soil fraction, the secondary and tertiary fractions, the carbonate and organic contents (if present) and the origin of the deposit where possible.

NOTE Other chemical constituents such as salt, sulfate, gypsum can be described where present.

The description and identification of the soil can be reviewed subsequently, and adjusted if necessary, by the results of grading, plasticity and/or laboratory tests to measure carbonate or organic contents.

Following identification, the description of the soil shall be made using the methods given in Clause 6 and Clause 7 to include relevant features.

The identification and description of soils shall conform to the flow chart in Figure 1.

The identification procedure for the mineral soils follows these steps:

a) categorization of soils into subcategories: very coarse soil, coarse soil and fine soil;

b) identification of primary, secondary and tertiary fractions;

c) naming of the soil according to the procedures outlined in this document;

d) identification of the origin of the deposit in terms of the depositional environment and geological age.

Mineral soils can contain some organic matter, but this organic content does not dominate the engineering properties of the soil. Such soils are categorized as mineral soils with organic secondary constituents.

5 Identification of soil

5.1 Mineral soil

5.1.1 General

Identification of very coarse and coarse mineral soils shall be made on the basis of the particle size fractions. The identification of fine soil shall be made on the basis of the plasticity of the soil, despite particle sizes also being defined for these soils. Table 1 shows the terms to be used for each size fraction, together with the corresponding range of particle sizes.

Table 1 — Particle size fractions

Soil group	Particle size fractions (symbol)	Range of 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)	>0,20 to ≤0,63
	Fine sand (fSa)	>0,063 to ≤0,20

Table 1 *(continued)*

Soil group	Particle size fractions (symbol)	Range of particle sizes mm
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

NOTE 1 The use of one significant figure (2 mm and 6 mm) rather than two significant figures (2,0 mm and 6,3 mm) for the boundaries is also widespread. The difference is of little significance in soil identification.

NOTE 2 Particle size ranges for silt and clay are given only as a reference for the particle size of "clay particles" and "silt particles" and not for "clay" and "silt" as fine fractions.