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Geotechnical investigation and testing - Sampling of soil, rock and groundwater - Part 1: Technical principles (ISO/DIS 22475-1:2018)

Geotechnische Erkundung und Untersuchung - Probenentnahmeverfahren und Grundwassermessungen - Teil 1: Technische Grundlagen der Ausführung (ISO/DIS 22475-1:2018)

Reconnaissance et essais géotechniques - Prélèvements d'échantillons de sol, roche et d'eau souterraine - Partie 1: Principes techniques (ISO/DIS 22475-1:2018)

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Geotechnical investigation and testing — Sampling of soil, rock and groundwater —

Part 1: Technical principles

*Reconnaissance et essais géotechniques - Prélèvements d'échantillons de sol, roche et d'eau souterraine —
Partie 1: Principes techniques*

ICS: 93.020

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

This **second** edition cancels and replaces the **first** edition of ISO 22475-1:2006 which has been technically revised.

The main changes compared to the previous edition are as follows:

- clauses on groundwater measurement will be part of ISO 18674-4,
- new sampling categories for soils,
- editorial update.

Introduction

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Geotechnical investigation and testing — Sampling of soil, rock and groundwater measurements

1 Scope

This document deals with principles of sampling of soil, rock and groundwater as part of the geotechnical investigation and testing.

NOTE 1 This document fulfils the requirements for sampling of soil, rock and groundwater, and groundwater measurements as part of geotechnical investigation and testing according to EN 1997-1 and EN 1997-2. The aims of such ground investigations are:

- a) to recover soil and rock samples of a quality sufficient to assess the general suitability of a site for geotechnical engineering purposes and to determine the required soil and rock characteristics in the laboratory;
- b) to obtain information on the sequence, thickness and orientation of strata and joint system and faults;
- c) to establish the type, composition and condition of strata;
- d) to obtain information on groundwater conditions and recover water samples for assessment of the interaction of groundwater, soil, rock and construction material.

The quality of a sample is influenced by the geological and hydrogeological conditions, the choice and execution of the drilling and/or the sampling method, handling, transport and storage of the samples.

Soil sampling for the purposes of agricultural and environmental soil investigation is not covered.

NOTE 2 Soil sampling for these purposes is to be found in ISO 10381 series.

Water sampling for the purposes of quality control, quality characterisation, and identification of sources of pollution of water, including bottom deposits and sludges is not covered.

NOTE 3 Water sampling for these purposes is to be found in ISO 5667 series.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN ISO 22476-3, *Geotechnical investigation and testing — Field testing — Part 3: Standard penetration testing*

EN ISO 22476-15, *Geotechnical investigation and testing — Field testing — Part 15: Measuring while drilling*

EN ISO 14688-1, *Geotechnical investigation and testing — Identification and classification of soil — Part 1: Identification and description*

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

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 13005, *Guidance for uncertainty for measurements*

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

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 14688-1 and EN ISO 14689-1 and the following apply.

3.1 Ground investigation methods

3.1.1

trial pit

an open excavation constructed to examine the ground conditions in-situ, recover samples or carry out field testing

3.1.2

shaft

an open or steeply inclined excavation, typically more than 5 m deep, constructed to examine the ground conditions in-situ, recover samples or carry out field testing

3.1.3

heading (adit)

a small tunnel driven horizontally or with a slight inclination from a shaft or into sloping ground to examine the ground conditions in-situ, recover samples and carry out field testing

3.1.4

borehole

a hole of any predetermined diameter and length formed in any geological formation or manmade material by drilling

NOTE Investigations carried out in such a hole can be to recover rock, soil or water samples from a specified depth or to carry out in situ tests and measurements

3.1.5

drilling

the process by which a borehole is produced in any geological formation by rotary, rotary percussive, percussive or thrust methods and in any predetermined direction in relation to the drill rig

3.1.6

small diameter drilling

drilling in the soil with a diameter greater than 30 mm but less than 80 mm

3.1.7

drilling method

the technique employed to create and stabilise the borehole

3.2 Drilling rigs and equipment

3.2.1

drilling tool

the device, which attached to or an integral part of the drill string, used for penetrating the geological formation as a cutting tool

3.2.2

drill bit

a device attached to, or an integral part of the drill string that is used as a cutting tool to penetrate the formation being drilled by the drilling method employed

3.2.3

drill rig

device which carries out the drilling function

3.2.4

casing

tubing temporarily or permanently inserted into a borehole

NOTE It is used e.g. to stabilise it, or to prevent the loss of flushing medium to the surrounding formation, or to prevent cross flow between different groundwater horizons

3.2.5

flushing medium

liquid or gaseous medium to move cuttings and/or samples and to lubricate and cool the drilling tool from the borehole

3.2.6

flushing additive

a substance added to the flushing medium in order to affect or change its properties to improve its functioning

3.2.7

core lifter

a split, internally slotted or serrated conical spring steel ring fitted to the corebarrel to hold and retain the core sample whilst the corebarrel is being hoisted from the borehole

3.2.8

sample retainer

a cylindrical device containing flexible spring fingers, hinged wedged shaped fingers or a hinged flap mounted in a carrier ring and mounted at the lower end of the sampler tube and used to retain the sample in the tube as the sampler is being lifted from the ground

3.3 Sampling

3.3.1

sampling by drilling (continuous sampling)

a process by which samples are obtained by the drilling tools as the borehole proceeds

NOTE The drilling process is designed to obtain complete samples of the length of the borehole. The drilling tools are used as sampling tools.

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3.3.2

sampling by using sampler

a process by which samples are obtained by samplers from trial pits, headings, shafts or borehole bottom at selected positions

3.3.3

soil sampling by small diameter drilling

sampling by drilling in soils using drilling tools with a diameter greater than 30 mm but less than 80 mm

3.3.4

sample

a defined amount of rock, soil or groundwater recovered from recorded depth

3.3.5

sampling category

a category of equipment and procedures to enable a certain quality class of soil or rock samples to be obtained

3.3.6

core, core sample

a cylindrical sample of soil or rock obtained from a borehole

3.3.7

block sample

sample of soil or rock cut out by special techniques

3.3.8

cuttings

the particles of geological formations formed in the borehole by the cutting action of the drilling tool and carried to the surface by the flushing medium or by an appropriate device

3.3.9**suspended matter**

abraded ground material in the flushing medium generated by drilling, in which the individual particle size cannot be recognised with the naked eye

3.3.10**core run**

the length of the core drilling between the start and the finish for the removal of the sample

3.3.11**core loss**

difference between a core run and the length of the core recovered

3.3.12**area ratio**

C_a
the ratio of the area of soil displaced by the sampler tube in proportion to the area of the sample (see Figure 1):

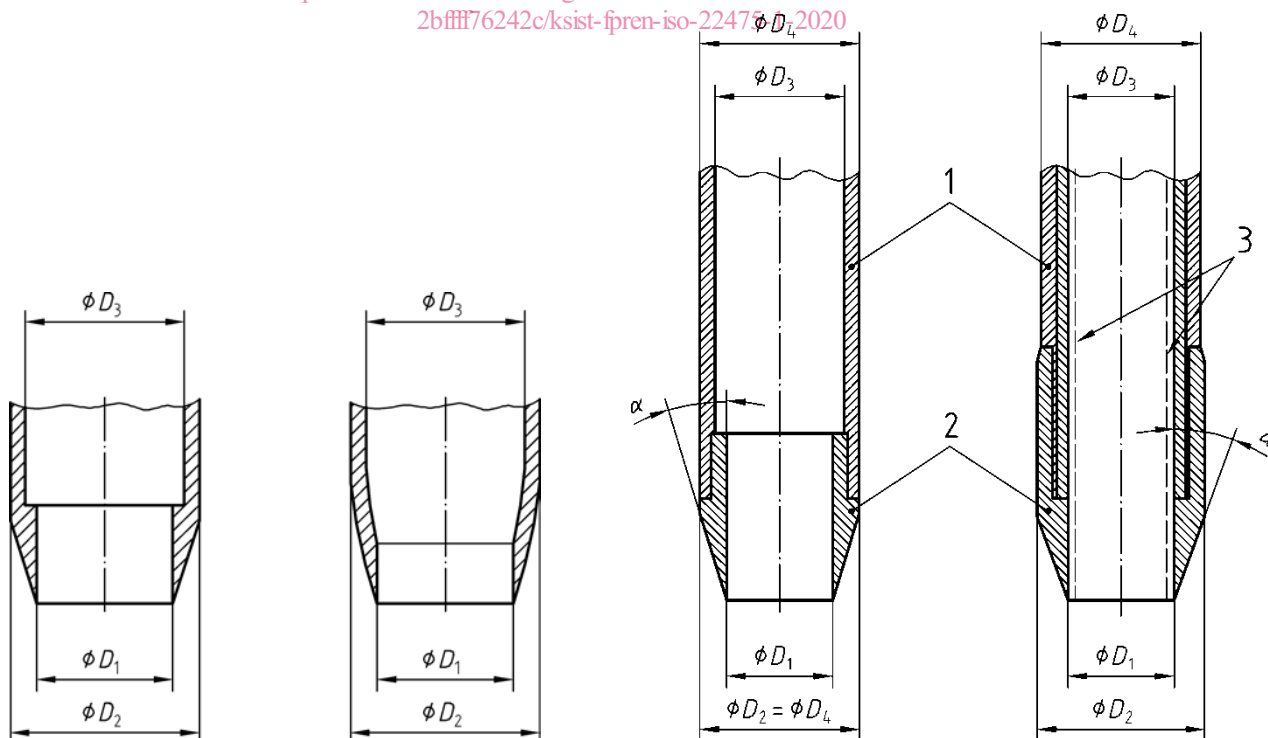
$$C_a = \frac{D_2^2 - D_1^2}{D_1^2} \cdot 100 \text{ in } \%$$

NOTE One of the factors that determines the mechanical disturbance of the soil.

3.3.13**inside clearance ratio**

C_i
 $C_i = \frac{D_3 - D_1}{D_1} \cdot 100 \text{ in } \%$ (see Figure 1)

NOTE One of the factors that determines the mechanical disturbance of the sample caused by the friction on the inside wall of sample tube or of the liner.

**Key**

D_1 inside diameter of the cutting shoe
 D_2 greatest outside diameter of the cutting shoe

α taper angle
 1 sample tube

D_3	inside diameter of the sample tube or liner	2	cutting shoe
D_4	outside diameter of the sample tube	3	liner (optional)

Figure 1 — Definitions of the diameters D_1 , D_2 , D_3 and D_4

3.3.14

sample recovery ratio in soil

TC

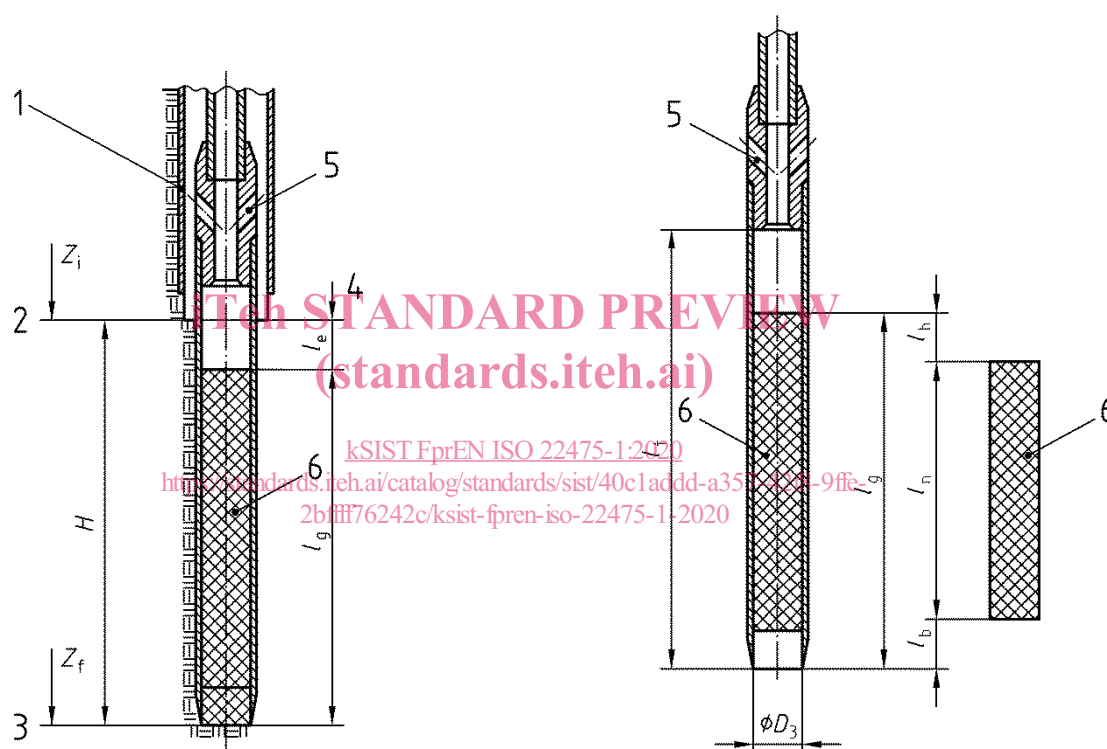
ratio of the length of the sample l_g to the length of the sample run H (see Figure 2)

3.3.15

net sample recovery ratio

IC

ratio of the net length of the sample l_n to the length of the sample run H (see Figure 2)



a) before withdrawal of sampler

b) after withdrawal of sampler

Key

1	casing	l_b	length of the lower part of the sample, which was remoulded or lost
2	beginning of coring	l_e	difference between the sample run and the actual length of the sample
3	end of coring	l_g	total length of the sample after withdrawal of the sampler, measured from the top of the sample to the cutter edge, including the remoulded or lost parts at both ends of the sample
4	bottom of predrilled borehole	l_h	length of the remoulded or polluted upper part of the sample
5	vent-hole	l_n	net length of the sample, before its conditioning effective (useful) length of the sampling tube
6	sample	l_t	
D_3	the inside diameter of the sample tube or liner		
H	length of the sample run		
Z_f	depth under the natural ground level of the lower end of the sampler after sampling and before withdrawing the sampler		
Z_i	depth under the natural ground level of the borehole bottom before sampling, and of the beginning of the following core run		

Figure 2 — Lengths of core run and sample