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Geotechnical investigation and testing - Field testing - Part 1: Electrical cone and piezocone penetration tests (ISO/DIS 22476-1:2005)

ICS 93.020

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Geotechnical investigation and testing - Field testing - Part 1: Electrical cone and piezocone penetration tests (ISO/DIS 22476-1:2005)

Reconnaissance et essais géotechniques - Essais en place - Partie 1: Essais électriques de pénétration au cône et au piézocone (ISO/DIS 22476-1:2005)

This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 341.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. prEN ISO 22476-1:2005: E

Foreword

This document (prEN ISO 22476-1:2005) has been prepared by Technical Committee CEN/TC 341 "Geotechnical Investigation and Testing", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 182 "Geotechnics".

This document is currently submitted to the parallel Enquiry.

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Geotechnical investigation and testing — Field testing —

Part 1:
Electrical cone and piezocone penetration tests

Reconnaissance et essais géotechniques — Essais en place —

Partie 1: Essais électriques de pénétration au cône et au piézocone

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ISO/CEN PARALLEL ENQUIRY

This draft International Standard is a draft standard developed within the European Committee for Standardization (CEN) and processed under the CEN-lead mode of collaboration as defined in the Vienna Agreement. The document has been transmitted by CEN to ISO for circulation for ISO member body voting in parallel with CEN enquiry. Comments received from ISO member bodies, including those from non-CEN members, will be considered by the appropriate CEN technical body. Should this DIS be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS vote in ISO and formal vote in CEN.

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 22476-1 was prepared by Technical Committee ISO/TC 182, *Geotechnics*, Subcommittee SC 1, *Geotechnical investigation and testing*.

ISO 22476 consists of the following parts, under the general title *Geotechnical investigation and testing — Field testing*:

- *Part 1: Electrical cone and piezocone penetration tests*
- *Part 2: Dynamic probing*
- *Part 3: Standard penetration test*
- *Part 4: Menard pressuremeter test*
- *Part 5: Flexible dilatometer test*
- *Part 6: Self-boring pressuremeter test*
- *Part 7: Borehole jack test*
- *Part 8: Full displacement pressuremeter test*
- *Part 9: Field vane test*
- *Part 10: Weight sounding test (TS)*[1)]
- *Part 11: Flat dilatometer test (TS)*[1)]
- *Part 12: Mechanical cone penetration test*
- *Part 13: Plate loading test.*

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1) TS Technical Specification.

Introduction

The electrical cone penetration test (CPT/CPTU) consists of pushing a cone penetrometer using a series of push rods into the soil at a constant rate of penetration. During penetration, measurements of cone resistance and sleeve friction can be recorded. The piezocone penetration test (CPTU) also includes the measurement of pore pressures at or close to the cone. The test results may be used for interpretation of stratification, classification of soil type and evaluation of engineering soil parameters. This standard is split in two parts: Part 1 describes CPT and CPTU practice using electronic transducers. EN ISO 22476-13 describes CPT practice using mechanical measuring systems.

Geotechnical investigation and testing — Field testing — Part 1: Electrical cone and piezocone penetration tests

1 Scope

This document deals with equipment requirements, the execution of and reporting on electrical cone and piezocone penetration tests as part of geotechnical investigation and testing according to EN 1997-1 and EN 1997-2.

The results from a cone penetration test are used to evaluate:

— stratification;

— soil type;

— soil density and in situ stress conditions;

— mechanical soil properties:

  — shear strength parameters;

  — deformation and consolidation characteristics.

Within the electrical cone and piezocone penetration test, two subcategories of the cone penetration test are considered:

— The electrical cone penetration test (CPT) that includes measurement of cone resistance and sleeve friction;

— The piezocone test (CPTU) that is a cone penetration test with the additional measurement of pore pressure.

The CPTU is performed like a CPT with the measurement of the pore pressure at one or several locations on the penetrometer surface.

NOTE CPT or CPTU are also used without measurement of sleeve friction.

This document specifies the following features:

a) the type of cone penetration test, according to Table 1;

b) the Application Class, according to Table 2;

c) the achievable penetration length or penetration depth;

d) the elevation of the ground surface or the underwater ground surface at the location of the cone penetration test with reference to a datum;

e) the location of the cone penetration test relative to a reproducible fixed location reference point;

f) if applicable, the method of back filling of the hole in the soil resulting from the cone penetration test;

g) if applicable, the depths and duration of the pore pressure dissipation tests.

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.

ISO 8503, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-clean steel substrates.*

ISO 10012-1, *Quality Assurance Requirements for Measuring Equipment — Part 1: Metrological confirmation system for measuring equipment.*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
average surface roughness
R_a
average deviation between the real surface of the probe and a medium reference plane placed along the surface of the probe

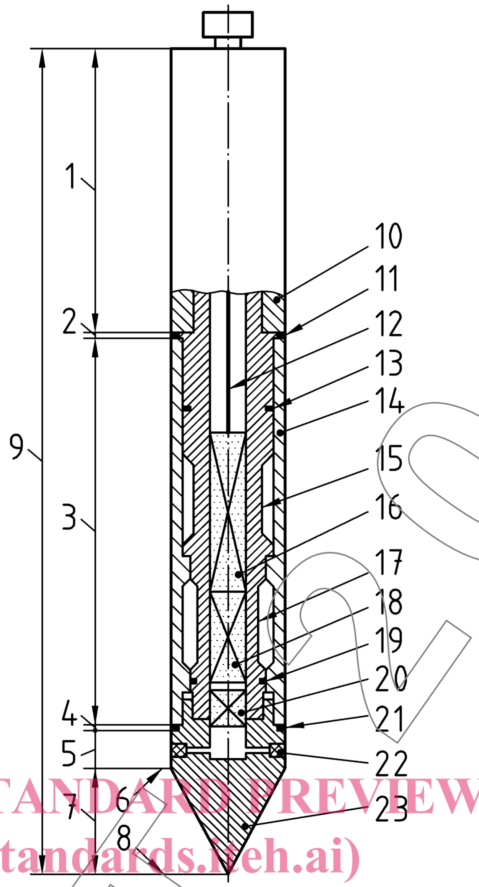
3.2
cone
conical shaped bottom part of the cone penetrometer. When pushing the penetrometer into the ground, the cone resistance is transferred through the cone to the load sensor

NOTE This document assumes that the cone is rigid, so when loaded its deformation is very small relative to the deformation of other parts of the cone penetrometer.

3.3
cone penetration test
CPT
pushing of a cone penetrometer at the end of a series of cylindrical push rods into the ground at a constant rate of penetration

3.4
electrical cone penetration test
CPT where forces are measured electrically in the cone penetrometer

3.5
piezocone penetration test
CPTU
electrical CPT with measurement of the pore pressures at or close to the cone



Key

1 shaft
2 gap between friction sleeve and shaft
3 friction sleeve
4 gap between friction sleeve and cone
5 cylindrical extension above base of cone
6 base of cone
7 face of cone
8 apex of cone
9 push rod connector
10 soil seal
11 electrical cable for signal transmission
12 water seal
13 friction sleeve
14 friction sleeve sensor
15 amplifier unit
16 core sensor
17 inclinometer
18 water seal
19 pressure sensor
20 soil seal
21 filter
22 cone
23 penetrometer tip

Figure 1 — Cross section of an example of a cone penetrometer

3.6
cone penetrometer
assembly containing the cone, friction sleeve, any other sensors and measuring systems as well as the connection to the push rods.

NOTE An example of a cone penetrometer is shown in Figure 1; for other filter locations see Figure 2.