INTERNATIONAL STANDARD

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Geotechnical investigation and testing — Field testing —

Part 1: Electrical cone and piezocone penetration test

Reconnaissance et essais géotechniques — Essais en place —

Partie 1: Essais de pénétration au cône électrique et au piézocône

Reference number
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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 the European Committee for Standardization (CEN) Technical Committee CEN/TC 341, *Geotechnical investigation and testing*, in collaboration with Technical Committee ISO/TC 182, *Geotechnics*, Subcommittee SC 1, *Geotechnical investigation and testing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

— *Part 1: Electrical cone and piezocone penetration test*

— *Part 2: Dynamic probing*

— *Part 3: Standard penetration test*

— *Part 4: Ménard pressuremeter test*

— *Part 5: Flexible dilatometer test*

— *Part 7: Borehole jack test*

— *Part 9: Field vane test*

— *Part 10: Weight sounding test* [Technical Specification]

— *Part 11: Flat dilatometer test* [Technical Specification]

— *Part 12: Mechanical cone penetration test (CPTM)*

Introduction

The electrical cone penetration test (CPT) 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 are recorded. The piezocone penetration test (CPTU) also includes the measurement of pore pressures around the cone. The test results can be used for interpretation of stratification, classification of soil type and evaluation of engineering soil parameters. Two International Standards define cone penetration tests: ISO 22476-1 defines CPT and CPTU practice using electronic transducers; ISO 22476-12 defines CPT practice using mechanical measuring systems.

“Cone resistance” is the term used in practice and in this part of ISO 22476, although “cone penetration resistance” is a more correct description of the process.

The test results of this part of ISO 22476 are specially suited for the qualitative and/or quantitative determination of a soil profile together with direct investigations (e.g. sampling according to ISO 22475-1 [2]) or as a relative comparison of other *in situ* tests.

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

— stratification;

— soil type;

— geotechnical parameters such as

  — soil density,

  — shear strength parameters, and

  — deformation and consolidation characteristics.

Geotechnical investigation and testing — Field testing —

Part 1:
Electrical cone and piezocone penetration test

1 Scope

This part of ISO 22476 deals with equipment requirements, the execution of and reporting on electrical cone and piezocone penetration tests.

NOTE 1 This part of ISO 22476 fulfills the requirements for electrical cone and piezocone penetration tests as part of geotechnical investigation and testing according to EN 1997-1 [3] and EN 1997-2 [4].

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

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

— piezocone test (CPTU), which 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 2 CPT or CPTU can also be used without measurement of sleeve friction, but this is not covered in this part of ISO 22476.

This part of ISO 22476 specifies the following features:

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

b) application class, according to Table 2;

c) penetration length or penetration depth;

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

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

f) pore pressure dissipation tests.

NOTE 3 This part of ISO 22476 covers onshore and nearshore CPT. For extra requirements for offshore CPT, see NORSOK G-001 [8].

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-cleaned steel substrates*

ISO 10012, *Measurement management systems — Requirements for measurement processes and measuring equipment*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1

average surface roughness
Ra
average deviation between the real surface of the cone penetrometer and a medium reference plane placed along the surface of the cone penetrometer

3.1.2

cone
conical shaped bottom part of the cone penetrometer and the cylindrical extension

NOTE 1 When pushing the penetrometer into the ground, the cone resistance is transferred through the cone to the load sensor.

NOTE 2 This part of ISO 22476 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.

3.1.3

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

3.1.4

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.