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Part 11: Flat dilatometer test

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Foreword

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ISO/TS 22476-11 was prepared by Technical Committee ISO/TC 182, *Geotechnics*, Subcommittee SC 1, *Geotechnical investigation and testing*.

ISO/TS 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: Ménard 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*
— *Part 11: Flat dilatometer test*
— *Part 12: Mechanical cone penetration test*
— *Part 13: Plate loading test*

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Foreword

This document CEN ISO/TS 22476-11:2004 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”.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

EN ISO 22476 *Geotechnical investigation and testing - Field testing* has the following parts:

— Part 1: Electrical cone and piezocone penetration tests

— Part 2: Dynamic probing

— Part 3: Standard penetration test

— Part 4: Ménard pressuremeter test

— Part 5: Flexible dilatometer test

— Part 6: Self-boring pressuremeter test (TS)[1)]

— Part 7: Borehole jack test

— Part 8: Full displacement pressuremeter test (TS) [1)]

— 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.

1) TS Technical Specification.

Introduction

The flat dilatometer test covers the determination of the in situ strength and deformation properties of fine grained soils using a blade shaped probe having a thin circular steel membrane mounted flush on one face.

Results of flat dilatometer tests are mostly to obtain information on soil stratigraphy, in situ state of stress, deformation properties and shear strength.

The basis of the test consists of inserting vertically into the soil a blade–shaped steel probe with a thin expandable circular steel membrane mounted flush on one face and determining, at selected depths or in a semi-continuous manner, the contact pressure exerted by the soil against the membrane when the membrane is flush with the blade and subsequently the pressure exerted when the central displacement of the membane reaches 1,10 mm.

The flat dilatometer test is most appropriate in clays, silts and sands where particles are small compared to the size of the membrane.

1 Scope

This Technical Specification comprises requirements for ground investigations by means of the flat dilatometer test (DMT) as part of the geotechnical investigation services according to prEN 1997-1 and prEN 1997-2.

2 Normative references

Not applicable.

3 Terms and definitions

For the purposes of this Technical Specification, the following terms and definitions apply

3.1
dilatometer blade (dilatometer probe)
blade –shaped steel probe that is inserted into the soil to run a flat dilatometer test

3.2
membrane
circular steel membrane that is mounted flush on one face of the blade and is expanded when applying a gas pressure at its back

3.3
switch mechanism
apparatus housed inside the blade, behind the membrane, capable of activating and disconnecting an electric contact which in turn sets on and off an audio and/or visual signal when the membrane expands and reaches two preset deflections equal to 0,05 mm and 1,10 mm respectively

3.4
pneumatic-electric cable
cable that connects the control unit to the blade, delivers gas pressure at the back of the membrane, and provides electric continuity between the control unit and the switch mechanism

3.5
control and calibration unit
set of suitable devices capable of supplying gas pressure to the back of the membrane and measuring the pressure when the switch mechanism activates and disconnects the electric contact behind the membrane

3.6
earth wire
wire connecting the control unit to the earth

3.7
pressure source
pressurized gas tank filled with any dry nonflammable and noncorrosive gas

3.8
membrane calibration
procedure to determine the membrane calibration pressure equal to the suction and the pressure that is applied in air to the back of the membrane to retract its centre to 0,05 mm expansion or to expand it to 1,10 mm respectively

3.9
dilatometer profiling
execution of a sequence of dilatometer tests from the same station at ground level along a vertical direction at closely spaced intervals with depth increments ranging between 150 mm and 300 mm

3.10
A-pressure
pressure (P_A) that is applied to the back of the membrane to expand its centre 0,05 mm in soil

3.11
B-pressure
pressure (P_B) that is applied to the back of the membrane to expand its centre 1,10 mm in soil

3.12
A-membrane-calibration-pressure
suction, (Δp_A) recorded as a positive value, that must be applied to the back of the membrane to retract its centre to the 0,05 mm deflection in air

3.13
B-membrane-calibration-pressure
pressure (Δp_B) that must be applied to the back of the membrane to expand its centre to the 1,10 mm deflection in air

3.14
$\Delta p_{A;\,avg}$ and $\Delta p_{B;avg}$
averaged values of the membrane calibration pressure obtained from the respective values of ΔP_A and ΔP_B measured before and after each dilatometer profiling or single dilatometer test

3.15
Z_m - pressure
gauge pressure deviation from zero when venting the blade to atmospheric pressure

3.16
soil pressure
p_0
soil pressure against the membrane when it is flush with the blade (e.g. at zero expansion), see Figure 1

NOTE The term "contact pressure" is also used.

3.17
soil pressure
p_1
soil pressure against the membrane when its centre is expanded 1,10 mm (see Figure 1)

3.18
in situ pore water pressure prior to blade insertion
u_0
in situ pore water pressure prior to blade insertion at the elevation of the centre of the membrane

3.19
in situ effective vertical stress
σ'_{vo}
vertical stress prior to blade insertion at the elevation of the centre of the membrane

3.20
dilatometer material index
I_{DMT}
index related to the type of soil

3.21
dilatometer horizontal stress index
K_{DMT}
index related to the situ horizontal stress

3.22
dilatometer modulus
E_{DMT}
parameter related from theory to the modulus of elasticity of the soil

4 Equipment

4.1 Dilatometer equipment

The equipment shall comprise of the following items:

— dilatometer blade with suitable threader adaptor to connect to push rods;

— pneumatic-electrical cable;

— earth wire;

— control and calibration unit;

— pressure source.

The dimensions of the blade, of the apex angle of the penetrating edge and of the membrane shall be within the limits shown in Figure 1.