SLOVENSKI STANDARD
SIST-TS CEN ISO/TS 17892-10:2004

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Geotehniļ no preiskovanje in preskuġanje ï Laboratorijsko preskuġanje zemljin ï 10. del: Neposredni striġni preskus (ISO/TS 17892-10:2004)

Geotechnical investigation and testing - Laboratory testing of soil - Part 10: Direct shear tests (ISO/TS 17892-10:2004)

Geotechnische Erkundung und Untersuchung - Laborversuche an Bodenproben - Teil 10: Direkte Scherversuche (ISO/TS 17892-10:2004)

Reconnaissance et essais géotechniques - Essais de laboratoire sur les sols - Partie 10: Essais de cisaillement direct (ISO/TS 17892-10:2004)

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93.020	Zemeljska dela. Izkopavanja. Gradnja temeljev. Dela pod zemljo	Earthworks. Excavations. Foundation construction. Underground works

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Geotechnical investigation and testing - Laboratory testing of soil - Part 10: Direct shear tests (ISO/TS 17892-10:2004)

Reconnaissance et essais géotechniques - Essais de sol au laboratoire - Partie 10: Essai de cisaillement direct (ISO/TS 17892-10:2004)

Geotechnische Erkundung und Untersuchung - Laborversuche an Bodenproben - Teil 10: Direkte Scherversuche (ISO/TS 17892-10:2004)

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Contents

Foreword

This document (CEN ISO/TS 17892-10:2004) 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CEN ISO/TS 17892 consists of the following parts, under the general title *Geotechnical investigation and testing — Laboratory testing of soil*:

— Part 1: Determination of water content.

— Part 2: Determination of density of fine-grained soil.

— Part 3: Determination of particle density - Pycnometer method.

— Part 4: Determination of particle size distribution.

— Part 5: Incremental loading oedometer test.

— Part 6: Fall cone test.

— Part 7: Unconfined compression test of fine-grained soils.

— Part 8: Unconsolidated undrained triaxial test.

— Part 9: Consolidated triaxial compression tests.

— Part 10: Direct shear tests.

— Part 11: Permeability tests.

— Part 12: Determination of Atterberg limits.

Introduction

This document covers areas in the international field of geotechnical engineering never previously standardised. It is intended that this document presents broad good practice throughout the world and significant differences with national documents is not anticipated. It is based on international practice (see [1]).

1 Scope

This document specifies laboratory test methods to establish the effective shear strength parameter for soils within the scope of the geotechnical investigations according to prEN 1997-1 and -2.

The test method consists of placing the test specimen in the direct shear device, applying a pre-determined normal stress, providing for draining (and wetting if required) of the test specimen, or both, consolidating the specimen under normal stress, unlocking the frames that hold the specimen, and displacing one frame horizontally with respect to the other at a constant rate of shear-deformation and measuring the shearing force, and horizontal displacements as the specimen is sheared. Shearing is applied slowly enough to allow excess pore pressures to dissipate by drainage so that effective stresses are equal to total stresses.

Direct shear tests are used in earthworks and foundation engineering for the determination of the effective shear strength of soils.

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.

prEN 1997-1, *Eurocode 7: Geotechnical design — Part 1: General rules.*

prEN 1997-2, *Eurocode 7: Geotechnical design — Part 2: Ground investigation and testing.*

CEN ISO/TS 17892-1, *Geotechnical investigation and testing — Laboratory testing of soil — Part 1: Determination of water content (ISO/TS 17892-1:2004)*

3 Terms and definitions

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

3.1
direct shear test
test whereby a square or circular prism or annular specimen of soil is laterally restrained and sheared along a mechanically induced horizontal plane while subjected to a pressure applied normal to that plane

3.2
shearbox test
direct shear test whereby a specimen is placed in a rigid container (shearbox) which is square or circular and divided horizontally into two halves.

NOTE Shearing is applied by displacing the two halves of the shearbox relative to each other (see Figure 1)

3.3
ring shear test
direct shear test whereby an annular specimen is subjected to rotational shear while subjected to vertical stress (see Figure 2)

3.4
friction angle
φ'
angle of friction, as determined from effective stresses

3.5
cohesion
c'
cohesion intercept, as determined from effective stresses

4 Equipment

4.1 Shearbox

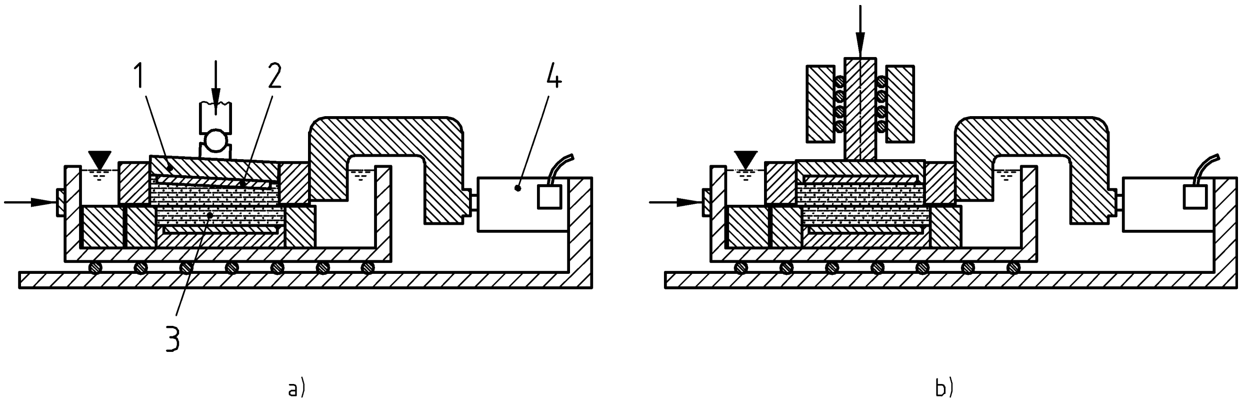
4.1.1 The shearbox shall be square or circular in plan and divided horizontally into two rigid halves which prevent horizontal deformation of the specimen.

4.1.2 Arrangements shall be provided for locking the two halves of the shearbox securely together while the specimen is being placed, and for lifting the upper half of the box from the lower half by a small controlled vertical displacement without tilt, after applying vertical load to the specimen.

4.1.3 The arrangement shall be such that when released one half of the shearbox shall be able to move exactly parallel to the other half.

4.1.4 The loading cap shall be 0,5 mm smaller in plan than the internal dimensions of the shearbox and be rigid enough to transmit the vertical load uniformly to the specimen.

4.1.5 The loading cap should preferably be guided by a bearing to prevent tilting during shear.



Key

a conventional device

b parallel controlled device

1 loading pad

2 porous plate

3 soil specimen

4 force transducer

Figure 1 — Schematic drawing of a conventional and a parallel controlled shearbox

4.1.6 During testing, the shear box shall be placed in an outer container (the carriage), such that the test specimen is submerged under water during the test.

4.1.7 The carriage shall be supported on the bed of the machine by a low-friction bearing which allows movement in the longitudinal direction only.

4.1.8 To achieve a uniform distribution of the shear stresses over the plan of the specimen rough porous filter plates shall cover the upper and the lower surface of the specimen. The porous plates shall be of a material which does not react chemically with the pore water or the soil. Their porosity shall prevent intrusions of soil into the pores, but shall allow free drainage of water throughout the test. Therefore the permeability of the porous platens shall be at least 10 times the permeability of the specimen.

4.1.9 Typical arrangements for a conventional and a parallel controlled shearbox are shown in Figure 1.

NOTE A parallel controlled shear box allows a correct simulation of in-situ shearing when shear planes occur. Investigations show that with cohesive soils the friction angle φ is up to 4° smaller and with non-cohesive soils it is up to 6° higher in a parallel controlled shearbox than in a conventional apparatus.

4.2 Ring shear apparatus

4.2.1 The apparatus shall be constructed such that shearing forces are purely torsional.

4.2.2 The soil container rings shall be of sufficient stiffness to prevent radial deformation of the specimen.

4.2.3 The soil container rings shall be integrated in a water bath which allows the specimen to be submerged during the test.

4.2.4 The upper and lower rings shall be fitted with porous platens having the same properties as those in the shear box (see 4.1.8).

4.2.5 The ring shear apparatus shall contain a device for application of vertical (normal) stresses.

4.2.6 A typical arrangement for a ring shear apparatus is shown in Figure 2.