

ICS 13.080.20; 93.020

English version

**Geotechnical investigation and testing - Laboratory testing of
soil - Part 11: Determination of permeability by constant and
falling head (ISO/TS 17892-11:2004)**

Reconnaissance et essais géotechniques - Essais de sol
au laboratoire - Partie 11: Détermination de la perméabilité
au perméamètre à charge constante ou variable (ISO/TS
17892-11:2004)

Geotechnische Erkundung und Untersuchung -
Laborversuche an Bodenproben - Teil 11: Bestimmung der
Durchlässigkeit mit konstanter und fallender Druckhöhe
(ISO/TS 17892-11:2004)

This Technical Specification (CEN/TS) was approved by CEN on 2 December 2003 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of 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.



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Test procedure	6
4.1 General requirements.....	6
4.1.1 Grading, particle structure and volume	6
4.1.2 Properties of water	6
4.1.3 Degree of saturation	6
4.2 Falling head	12
4.2.1 Apparatus	12
4.2.2 Test arrangement.....	13
4.2.3 Soil type and specimen dimensions.....	13
4.3 Constant head test in the permeameter	14
4.3.1 Apparatus	14
4.3.2 Test arrangement.....	14
4.3.3 Soil type and specimen dimensions.....	14
4.4 Constant head testing in the triaxial cell.....	15
4.4.1 Apparatus (see Figure 2).....	15
4.4.2 Test arrangement.....	16
4.4.3 Preparation of apparatus	16
5 Test results	17
5.1 Falling head	17
5.2 Constant head	18
5.3 Permeability in the triaxial cell	18
Bibliography	20
Figures	
Figure 1 — Water flow in a soil specimen	6
Figure 2 — Example for test arrangement for triaxial cell test	7
Figure 3 — Example for a test arrangement for constant head permeameter test.....	9
Figure 4 — Example for a test arrangement for compression permeameter test.....	10
Figure 5 — Apparatus for enclosing a specimen in a rubber membrane	11
Tables	
Table 1 — Back pressure as function of initial saturation	7
Table 2 — Correction factor α to allow for the viscosity of water	8
Table 3 — Classes of permeability tests	12
Table 4 — Example for test arrangement as a function of soil type	12

Foreword

This document (CEN ISO/TS 17892-11:2004) 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, 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 on fine grain soils
- Part 8: Unconsolidated undrained triaxial test
- Part 9: Consolidated triaxial compression tests on water saturated soils
- Part 10: Direct shear tests
- Part 11: Determination of permeability by constant and falling head
- Part 12: Determination of the 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 is intended for use in earthworks and foundation engineering. It specifies laboratory test methods to establish the coefficient of permeability of water through water-saturated soils. In the proposed laboratory tests soil specimens are subjected to a flow of water passing through the specimen. The water pressure conditions and volume of water passing through the specimens are measured for evaluation of the permeability.

The results obtained serve to calculate groundwater flow and to assess the permeability of man-made impervious layers and filter layers.

2 Normative references

The following referenced document is 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 1997-2, *Eurocode 7 - Geotechnical design — Part 2: Ground investigation and testing*.

3 Terms and definitions

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

3.1

flow rate

Q

quantity of water passing through a specimen per unit time, t

3.2

discharge velocity

v

rate of flow of water per unit area of soil (including particles and voids) normal to the direction of flow

3.3

hydraulic gradient

i

ratio of the difference in total head of water (head loss), h , between two gland points, to the length of the flow path, l (distance between the gland points measured in the direction of flow, see Figure 1)