Irish Standard
I.S. EN ISO 22282-1:2012

Geotechnical investigation and testing - Geohydraulic testing - Part 1: General rules (ISO 22282-1:2012)

I.S. EN ISO 22282-1:2012

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces:

This document is based on:
EN ISO 22282-1:2012

Published:
13 June, 2012

This document was published under the authority of the NSAI and comes into effect on:
13 June, 2012

ICS number:
93.020

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie

W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

I.S. EN ISO 22282-1:2012

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 22282-1

June 2012

ICS 93.020

English Version

Geotechnical investigation and testing - Geohydraulic testing - Part 1: General rules (ISO 22282-1:2012)

Reconnaissance et essais géotechniques - Essais géohydrauliques - Partie 1: Règles générales (ISO 22282-1:2012)

Geotechnische Erkundung und Untersuchung - Geohydraulische Versuche - Teil 1: Allgemeine Regeln (ISO 22282-1:2012)

This European Standard was approved by CEN on 31 May 2012.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 22282-1:2012: E

Contents

Page

Foreword.....3

Foreword

This document (EN ISO 22282-1:2012) has been prepared by Technical Committee CEN/TC 341 “Geotechnical Investigation and Testing", the secretariat of which is held by ELOT, in collaboration with Technical Committee ISO/TC 182 "Geotechnics".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

This page is intentionally left BLANK.

I.S. EN ISO 22282-1:2012

INTERNATIONAL STANDARD

ISO 22282-1

First edition
2012-06-01

Geotechnical investigation and testing — Geohydraulic testing —

Part 1: General rules

Reconnaissance et essais géotechniques — Essais géohydrauliques — Partie 1: Règles générales

Reference number
ISO 22282-1:2012(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword ... iv

Introduction ... v

1 Scope ... 1

2 Normative references ... 1

3 Terms, definitions and symbols ... 2
3.1 Terms and definitions ... 2
3.2 Symbols ... 4

4 Equipment ... 4
4.1 General ... 4
4.2 Test section support system ... 5
4.3 Measuring tube ... 5
4.4 Isolation of the test section ... 5
4.5 Measuring and recording devices ... 5
4.6 Additional equipment ... 6
4.7 Calibration ... 6

5 Planning of geohydraulic investigation and testing ... 6
5.1 General ... 6
5.2 Selection of testing locations ... 7
5.3 Selection of test procedure ... 7

6 Preparation of the test section and installation of equipment ... 14
6.1 Requirements for drilling and the test sections ... 14
6.2 Installation of filter ... 15
6.3 Checking installation ... 15
6.4 Safety requirements ... 15
6.5 Decommissioning ... 15
6.6 Factors influencing the test results ... 16

Annex A (informative) **Examples of possible test section isolation and support methods** ... 18

Annex B (informative) **Examples of shape factors** ... 24

Bibliography ... 26

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 22282-1 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 22282 consists of the following parts, under the general title *Geotechnical investigation and testing — Geohydraulic testing*:

— *Part 1: General rules*

— *Part 2: Water permeability tests in a borehole using open systems*

— *Part 3: Water pressure tests in rock*

— *Part 4: Pumping tests*

— *Part 5: Infiltrometer tests*

— *Part 6: Water permeability tests in a borehole using closed systems*

Introduction

The EU water directive requires the member states to increase activities that protect groundwater and fresh surface water both quantitatively and qualitatively[11]. At the same time, society requires more water and thus more construction projects below groundwater level in even deeper waters. In addition, the sea level may rise as a result of climate change. This contradiction requires engineers working on construction projects below groundwater level to make more reliable predictions on the effects of such structures on the groundwater conditions. This can partly be achieved by better assessment of the permeability of the ground by *in situ* tests as required in EN 1997-1:2004, 3.3.9.1. EN 1997-2:2007 contains the following stipulations, requirements and recommendations:

“2.1.4 Groundwater –

(1) Groundwater investigations shall provide all relevant information on groundwater needed for geotechnical design and construction.

(2) Groundwater investigations should provide, when appropriate, information on:

— the depth, thickness, extent and permeability of water-bearing strata in the ground, and joint systems in rock;

— the elevation of the groundwater surface or piezometric surface of aquifers and their variation over time and actual groundwater levels including possible extreme levels and their periods of recurrence;

— the pore water pressure distribution;

— the chemical composition and temperature of groundwater.

(3) The information obtained should be sufficient to assess the following aspects, where relevant:

— the scope for and nature of groundwater lowering work;

— possible harmful effects of the groundwater on excavations or on slopes (e.g. risk of hydraulic failure, excessive seepage pressure or erosion);

— any measures necessary to protect the structure (e.g. water proofing, drainage and measures against aggressive water);

— effects of groundwater lowering, desiccation, impounding, etc. on the surroundings;

— the capacity of the ground to absorb water injected during construction work;

— whether it is possible to use local groundwater, given its chemical constitution, for construction purposes.”

Geotechnical investigation and testing — Geohydraulic testing —

Part 1: General rules

1 Scope

This part of ISO 22282 establishes the general rules and principles for geohydraulic testing in soil and rock as part of the geotechnical investigation services in accordance with EN 1997-1 and EN 1997-2. It defines concepts and specifies requirements relating to permeability measurement in soil and rock.

The different purposes of geohydraulic testing are to obtain information on the permeability of soil or rock in natural or treated states, transmissivity and storage coefficient, and hydrodynamic parameters of aquifers.

Geohydraulic testing is used for many purposes, such as:

a) absorption capacity and effectiveness of grouting in rock mass;

b) assessment of seepage and drainage;

c) assessment of groundwater lowering work;

d) effects of cut-offs for dams;

e) effects of tunnels and shaft sinking;

f) checking fill or cover tightness;

g) assessment of the flow of fluids and suspensions in the ground;

h) planning for remedial measures.

NOTE 1 Geohydraulic testing for water supply is covered by ISO 14686.

NOTE 2 For most types of ground, field permeability tests yield more reliable data than those carried out in the laboratory, because a larger volume of material is tested, and because the ground is tested *in situ*, thereby including effects resulting from the structure of the ground mass but avoiding the disturbance associated with sampling.

This part of ISO 22282 deals with the execution of tests with groundwater and does not explicitly consider other fluids and suspensions. The flow of other fluids and suspensions can be considered by applying the different viscosities and relations between transmissivity, permeability coefficient and intrinsic permeability.

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 14688-1, *Geotechnical investigation and testing — Identification and classification of soil — Part 1: Identification and description*

ISO 14689-1, *Geotechnical investigation and testing — Identification and classification of rock — Part 1: Identification and description*

ISO 22282-2, *Geotechnical investigation and testing — Geohydraulic testing — Part 2: Water permeability tests in a borehole using open systems*