

## **Execution of special geotechnical works-Micropiles**

Execution of special geotechnical works - Micropiles

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 14199:2005 sisaldab Euroopa standardi EN 14199:2005 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 28.04.2005 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 14199:2005 consists of the English text of the European standard EN 14199:2005.</p> <p>This document is endorsed on 28.04.2005 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> This document establishes general principles for the execution of micropiles. They are for: - drilled micropiles a shaft diameter not greater than 300 mm; - driven micropiles a shaft diameter or a maximum shaft cross sectional extension not greater than 150 mm.</p>	<p><b>Scope:</b> This document establishes general principles for the execution of micropiles. They are for: - drilled micropiles a shaft diameter not greater than 300 mm; - driven micropiles a shaft diameter or a maximum shaft cross sectional extension not greater than 150 mm.</p>
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**Võtmesõnad:** force, measurement, pile driving, reinforcement, safety against, sample surveys, site investigations, special geotechnical work, specification (approval), specifications, structural engineering, structural members, structures, subsoil, surveillance (approval)

ICS 93.020

English version

## Execution of special geotechnical works - Micropiles

Exécution de travaux géotechniques spéciaux - Micropieux

Ausführung von besonderen geotechnischen Arbeiten  
(Spezialtiefbau) - Pfähle mit kleinen Durchmessern  
(Mikropfähle)

This European Standard was approved by CEN on 27 October 2004.

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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 Central Secretariat has the same status as the official versions.

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## Foreword

This document (EN 14199:2005) has been prepared by Technical Committee CEN/TC 288 "Execution of special geotechnical works", the secretariat of which is held by AFNOR.

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 September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

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.

The general scope of CEN/TC 288 is the standardisation of the execution procedures for geotechnical works, including testing and control methods, and the required material properties. WG 8 has been charged with the subject area of micropiles.

The document has been prepared to stand along side EN 1997-1. Clause 7 of this Standard covers design aspects of micropiles.

It has been drafted by a working group comprising delegates from 14 countries and is based on the review of national and international codes of practice.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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 the United Kingdom.

## 1 Scope

**1.1** This document establishes general principles for the execution of micropiles.

They are for:

- drilled micropiles a shaft diameter not greater than 300 mm;
- driven micropiles a shaft diameter or a maximum shaft cross sectional extension not greater than 150 mm.

**1.2** Micropiles are structural members to transfer actions to the ground and may contain bearing elements to transfer directly or indirectly loads and or to limit deformations. Their shaft and base resistance may be improved (mostly by grouting) and they may be constructed with (see Figure 1):

- uniform cross section (straight shaft); or
- telescopically changing shaft dimensions;
- shaft enlargements; and/or
- base enlargement.

**1.3** Other than practical considerations, there are no limitations regarding, length, rake (definition of rake, see Figure 2), slenderness ratio or shaft and base enlargements.

**1.4** The provisions of the document apply to (see Figure 3):

- single micropiles;
- micropile groups;
- reticulated micropiles;
- micropile walls.

**1.5** The micropiles which are the subject of this document can be installed into the ground using drilling, driving or a combination of these methods.

**1.6** The material of micropiles covered by this document can be:

- steel or other reinforcement materials;
- grout, mortar or concrete;
- a combination of above.

**1.7** Micropiles may be used for:

- working under restricted access and/or headroom conditions;
- foundations of new structures (particularly in very heterogeneous soil or rock formations);
- reinforcing or strengthening of existing structures to increase the capacity to transfer load to depth with acceptable load settlement characteristics, e.g. underpinning works;
- reducing settlements and/or displacements;

- forming a retaining wall;
- reinforcing of soil to form a bearing and/or retaining structure;
- improving slope stability;
- securing against uplift;
- other applications where micropile techniques are appropriate.

**1.8** Mixed-in-place columns and timber piles are not included in this document. Columns constructed by jet grouting are covered by EN 12716. Ground anchors are covered by EN 1537.

## **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.

EN 197-1, *Cement - Part 1: Composition, specifications and conformity criteria for common cements.*

EN 206-1: *Concrete - Part 1: Specification, performance, production and conformity.*

EN 791, *Drill rigs – Safety.*

EN 934-2, *Admixtures for concrete, mortar and grout - Part 2: Concrete admixtures - Definitions, requirements, conformity, marking and labelling.*

EN 996, *Piling equipment – Safety requirements.*

EN 1008, *Mixing water for concrete - Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 1536:1999, *Execution of special geotechnical work - Bored piles.*

EN 1537:1999, *Execution of special geotechnical work - Ground anchors.*

EN 1991-1, *Eurocode 1: Basis of design and actions on structures – Part 1: Basis of design.*

EN 1992-1-1, *Eurocode 2: Design of concrete structures - Part 1: General rules and rules for buildings*

EN 1993-1-1, *Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings*

EN 1993-5, *Eurocode 3: Design of steel structures – Part 5: Piling.*

EN 1994-1-1, *Eurocode 4: Design of composite steel and concrete structures - Part 1-1: General rules for buildings.*

EN 1997-1:2004, *Eurocode 7: Geotechnical design – Part 1: General rules.*

EN 10025, *Hot-rolled products of non-alloy structural steels.*

EN 10080, *Steel for the reinforcement of concrete weldable ribbed reinforcing steel B 500 - Technical delivery conditions for bars, coils and welded fabric*

prEN 10138-4, *Prestressing steels - Part 4: Bars.*

EN 10210, *Hot finished structural hollow sections of non-alloy and fine grain structural steels.*

EN 12699:2000, *Execution of special geotechnical works - Displacement piles.*

EN 12794, *Precast concrete foundation piles.*

EN ISO 11960, *Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells (ISO 11960:2004)*

### 3 Terms and definitions

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

#### 3.1

##### **micropile**

**fr:** micropieu

**de:** Mikropfahl

piles which have a small diameter (smaller than 300 mm shaft diameter for drilled piles and not greater than 150 mm shaft diameter or maximum shaft cross sectional extension for driven piles)

#### 3.2

##### **enlarged base**

**fr:** base élargie

**de:** Fussaufweitung

base of the micropile formed to have a cross section greater than that of its shaft

#### 3.3

##### **shaft diameter**

**fr:** diamètre du fût

**de:** Pfahldurchmesser

diameter of the part of the micropile between the head and the base:

- a) for micropiles constructed with casing: equal to the external diameter of the casing;
- b) for micropiles constructed without casing: equal to the maximum diameter of the drilling tool, the maximal cross sectional extension of the driving tool;
- c) for prefabricated micropiles: equal to the external diameter or cross sectional extension.

#### 3.4

##### **preliminary micropile**

**fr:** micropieu préliminaire

**de:** Vorversuchs-Mikropfahl (Probepfahl 1)

micropile installed before the commencement of the main piling works or section of the works for the purpose of establishing the suitability of the chosen type of micropile and/or for confirming the design, dimensions and bearing capacity

#### 3.5

##### **trial micropile**

**fr:** micropieu de faisabilité

**de:** Eignungsversuchs-Mikropfahl (Probepfahl 2)

micropile installed to assess the practicability and suitability of the construction method for a particular application