ICS 93.020 SLOVENSKÁ TECHNICKÁ NORMA November 2015

STN	**Vykonávanie špeciálnych geotechnických prác. Vŕtané pilóty.**	**STN EN 1536:2010+A1** 73 1002

Execution of special geotechnical work - Bored piles

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/15

Obsahuje: EN 1536:2010+A1:2015

Oznámením tejto normy sa ruší
STN EN 1536 (73 1002) z apríla 2011

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1536:2010+A1

June 2015

ICS 93.020

Supersedes EN 1536:2010

English Version

Execution of special geotechnical work - Bored piles

Exécution des travaux géotechniques spéciaux - Pieux forés

Ausführung von Arbeiten im Spezialtiefbau - Bohrpfähle

This European Standard was approved by CEN on 2 July 2010 and includes Amendment 1 approved by CEN on 17 April 2015.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 1536:2010+A1:2015) 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of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

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.

This document supersedes ⟩A1⟨ EN 1536:2010 ⟩/A1⟨.

This document includes Amendment 1 approved by CEN on 2015-04-17.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟩A1⟨ ⟩/A1⟨.

The general scope of TC 288 is the standardisation of the execution procedures for geotechnical works (including testing and control methods) and of the required material properties. WG15 has been charged to revise EN 1536:1999, with the subject area of bored piles, including barrettes, but not "micro piles" of diameter less than 0,3 m.

The design, planning and execution of bored piles call for experience and knowledge in this specialised field. The execution phase requires skilled and qualified personnel and the present standard cannot replace the expertise of specialist contractor.

The document has been prepared to complement EN 1997-1, *Eurocode 7: Geotechnical design — Part 1: General rules* and EN 1997-2, *Eurocode 7 — Geotechnical design — Part 2: Ground investigation and testing*. Clause 7 "Considerations related to design" of this European Standard expands on design only where necessary (e.g. the detailing of reinforcement), but provides full coverage of the construction and supervision requirements.

⟩A1⟨ The amendment became necessary to accord the Standard EN 1536:2010 with EN 206:2013, Concrete – Specification, performance, production and conformity. EN 206:2013 has been revised to contain also the specific requirements for concrete for applications for special geotechnical works, making redundant respective provisions in EN 1536 (e.g. 6.1, 6.3 and 8.8).

Full according with EN 13670, Execution of concrete structures is however still pending. EN 1536:2010+A1:2015 therefore still contains specific requirements for bored piles as a concrete structure, such as the detailing of the reinforcement, the concrete placement and the supervision of concreting process which are complementing the provisions of EN 13670.

In addition, some editorial corrections were made in this amended Standard. ⟩/A1⟨

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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.

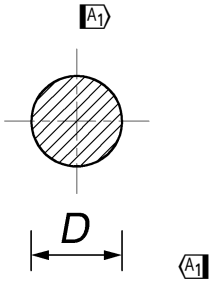
1 Scope

1.1 This European Standard establishes general principles for the execution of bored piles (see 3.2).

NOTE 1 This standard covers piles or barrettes which are formed in the ground by excavation and are structural members used to transfer actions and/or limit deformations.

NOTE 2 This standard covers piles with circular cross-section (see Figures 1 and A.1a)) and barrettes (see 3.3) with rectangular, **T** or **L** or any other similar cross-section (see Figure 2) concreted in a single operation.

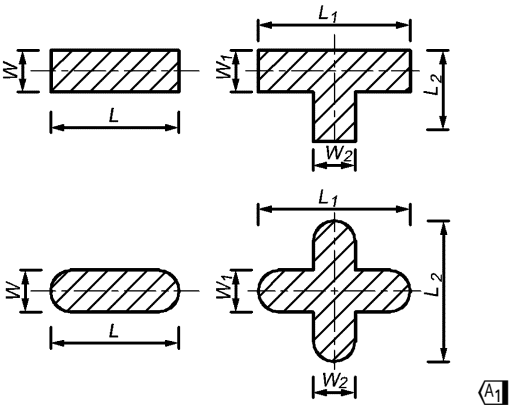
NOTE 3 In the standard the term pile is used for circular cross-section structure and the term barrette for other shapes. Both are bored piles.



Key

D Shaft diameter

Figure 1 — Bored pile with circular cross-section



Key

L Barrette length

W Barrette thickness

A Cross-sectional area of the shaft

Figure 2 — Bored pile with non circular cross-section (barrettes)

1.2 This European Standard applies to bored piles (see Figure 3) with:

— uniform cross-section (straight shaft);

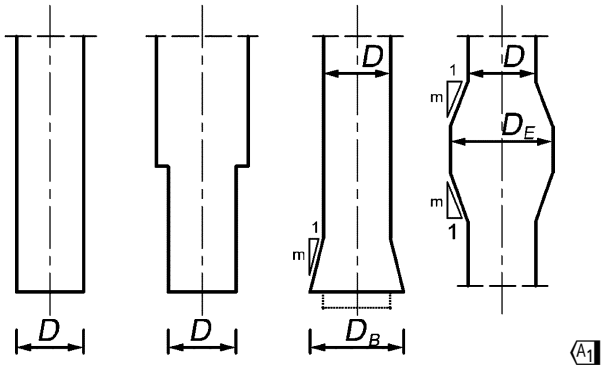
— telescopically changing shaft dimensions;

— excavated base enlargements; or

— excavated shaft enlargements.

NOTE The shape of a pile base and of an enlargement depends on the tool used for the excavation.

A1



A1

Key

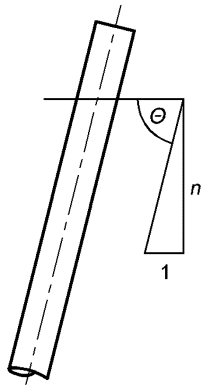
D Shaft diameter

D_B Base enlargement diameter

D_E Shaft enlargement diameter

Figure 3 — Examples for straight shaft piles and piles with shaft and base enlargement

A1



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Key

n Rake

Figure 4 — Definition of the rake

1.3 This European Standard applies (see Note) to:

— bored piles with a depth to width ratio ≥ 5;

— piles (see Figures 1 and 3) with a shaft diameter 0,3 m ≤ *D* ≤ 3,0 m;

— barrettes (see Figure 2) with the least dimension W_i ≥ 0,4 m, a ratio L_i / W_i between its largest and its least dimensions ≤ 6 and a cross-sectional area *A* ≤ 15 m²;

— piles with circular precast elements used as structural member (see Figure 7) with a least dimension D_P ≥ 0,3 m;

— barrettes with rectangular precast elements used as structural member with a least dimension W_P ≥ 0,3 m.

NOTE The standard covers a large range of diameters. For small diameter bored piles less than 450 mm, the general specification can be adapted to cater for the lack of space (e.g. minimum bars number and spacing).

1.4 This European Standard applies to piles with the following rake (see Figure 4):

— *n* ≥ 4 (*Θ* ≥ 76°);

— *n* ≥ 3 (*Θ* ≥ 72°) for permanently cased piles.

1.5 This European Standard applies to bored piles with the following dimensions of the shaft or base enlargements (see Figure 3):

a) base enlargements:

1) in non-cohesive ground: D_B / *D* ≤ 2;

2) in cohesive ground: D_B / *D* ≤ 3;

b) shaft enlargements in any ground: D_E / D ≤ 2;

c) slope of the enlargement in non-cohesive ground m ≥ 3;

1) in non-cohesive ground: m ≥ 3;

2) in cohesive ground: m ≥ 1,5;

d) base enlargements area of barrettes: A ≤ 15 m²;

1.6 The provisions of this European Standard apply to:

— single bored piles;

— bored pile groups (see Figure 5);

— walls formed by piles (see Figure 6).

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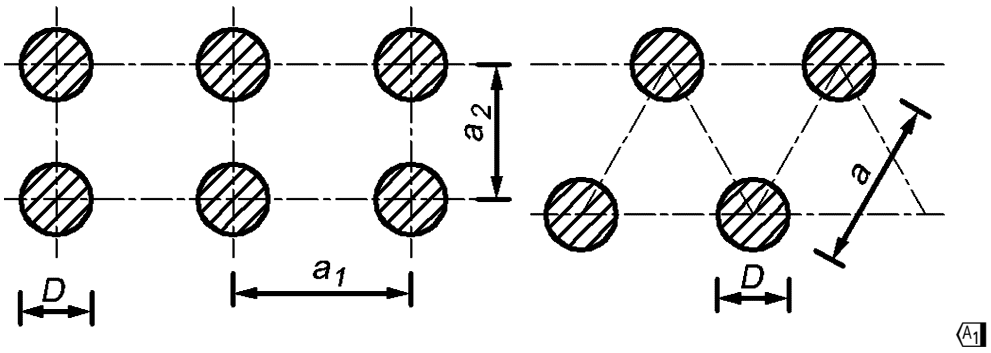

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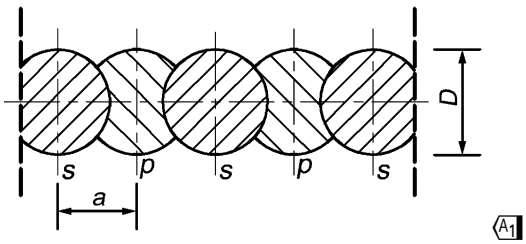
Key

D Shaft diameter

a_i Centre to centre spacing of the piles

Figure 5 — Examples of pile groups

A1



$a < D$

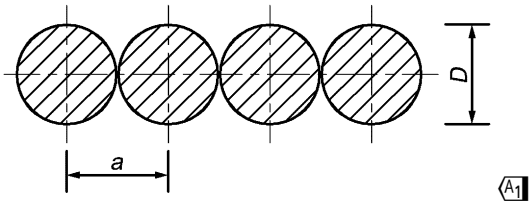
p primary piles

s secondary piles

A1

a) Secant pile wall

A1



$a \cong D$

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b) Contiguous pile wall

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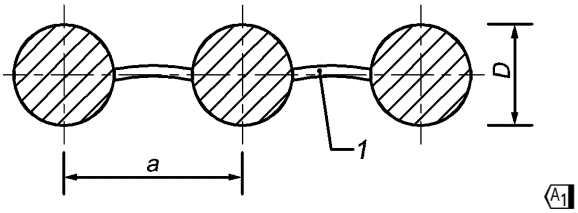


$a > D$

A1

c) Widely spaced pile wall

Key

a Centre to centre spacing of the piles

D Shaft diameter

1 Lagging

Figure 6 — Examples of pile walls

1.7 The bored piles which are the subject of this European Standard can be excavated by continuous or discontinuous methods using support methods for stabilizing the excavation walls where required.

1.8 This European Standard applies only to construction methods that allow the designed cross-sections to be produced.

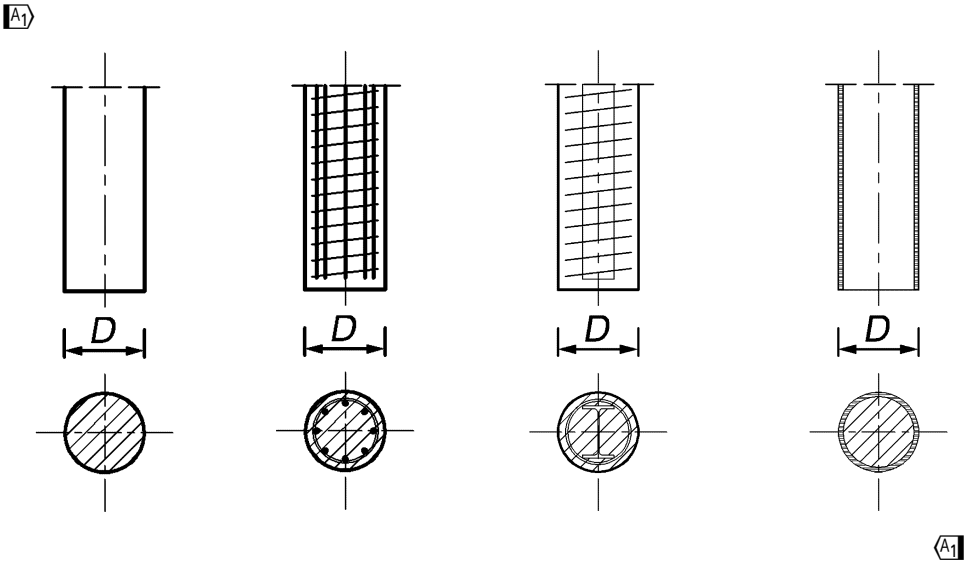
1.9 The provisions apply to bored piles (see Figure 7) constructed of:

— unreinforced (plain) concrete;

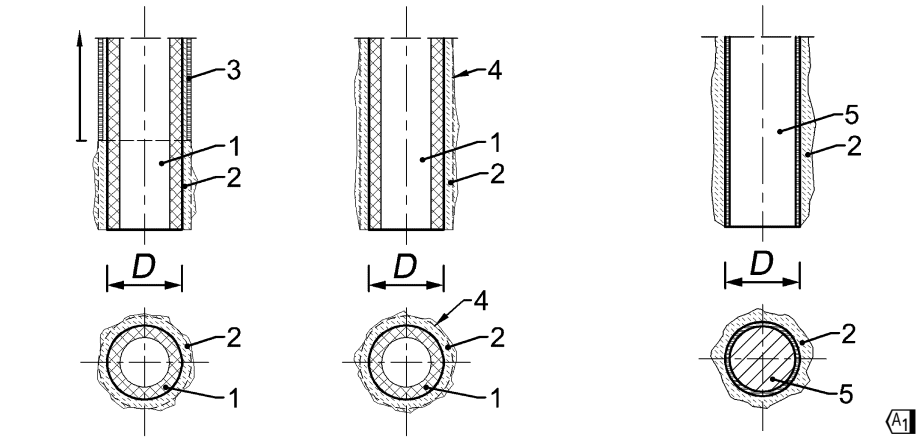
— reinforced concrete;

— concrete reinforced by means of special reinforcement such as steel tubes, steel sections or steel fibres;

— precast concrete (including prestressed concrete) elements or steel tubes where the annular gap between the element or tube and the ground is filled by concrete, cement or cement-bentonite grout.



a) Use of plain concrete **b) Use of concrete with bar reinforcement** **c) Use of special reinforcement (steel section or tube)**



d) Use of precast concrete element as main or supplementary structural member **e) Use of steel tube as main or supplementary structural member**

Key

1 Precast concrete element

2 Grout

3 Temporary casing (extracted)

4 Uncased excavation

5 Unreinforced or reinforced concrete or cement grout

D Shaft diameter

Figure 7 — Examples of bored piles with circular cross-section

1.10 Micropiles, mixed-in-place columns, columns constructed by jet grouting, ground improvement for piling, mixed-in-place pile bases and diaphragm walls are not covered by this European Standard.

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.

〚A1〛 *deleted text* 〚A1〛

〚A1〛 EN 206:2013, *Concrete — Specification, performance, production and conformity* 〚A1〛

EN 791, *Drill rigs — Safety*

〚A1〛 *deleted text* 〚A1〛

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 1990, *Eurocode — Basis of structural design*

EN 1991 (all parts), *Eurocode 1: Actions on structures*

EN 1992 (all parts), *Eurocode 2: Design of concrete structures*

EN 1993 (all parts), *Eurocode 3: Design of steel structures*

EN 1994 (all parts), *Eurocode 4: Design of composite steel and concrete structures*

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

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

EN 1998 (all parts), *Eurocode 8: Design of structures for earthquake resistance*

EN 10025-2, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10080, *Steel for the reinforcement of concrete — Weldable reinforcing steel - General*

EN 10210 (all parts), *Hot finished structural hollow sections of non-alloy and fine grain steels*

EN 10219 (all parts), *Cold formed welded structural hollow sections of non-alloy and fine grain steels*

〚A1〛 *deleted text* 〚A1〛

EN 12794, *Precast concrete products — Foundation piles*

EN 13670, *Execution of concrete structures*

ISO/DIS 22477-1, *Geotechnical investigation and testing — Testing of geotechnical structures — Part 1: Pile load test by static axially loaded compression*